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U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF FORESTRY—BULLETIN No. 56.

GIFFORD PINCHOT, Forester.

A WORKING PLAN

FOR

FOREST LANDS IN BERKELEY COUNTY, SOUTH CAROLINA.

BY

CHARLES S. CHAPMAN,

FOREST ASSISTANT, BUREAU OF FORESTRY.

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WASHINGTON:

GOVERNMENT PRINTING OFFICE.

1905.

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A TWO-STORIED FOREST OF LONGLEAF PINE.

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LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Bureau of Forestry,
Washington, D. C., June 30, 1905.

Sir: I have the honor to transmit herewith a report entitled "A Working Plan for Forest Lands in Berkeley County, South Carolina," by Charles S. Chapman, Forest Assistant in the Bureau of Forestry, and to recommend its publication as Bulletin No. 56 of the Bureau of Forestry.

The map and four plates accompanying the report are necessary for its proper illustration.

Very respectfully,

Gifford Pinchot,
Forester.

Hon. James Wilson,
Secretary of Agriculture.

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MAP.

Map of the Cooper River holdings of the E. P. Burton Company, Berkeley County, S. C. ..... (Folder) follows page 62

A WORKING PLAN FOR FOREST LANDS IN BERKELEY COUNTY, SOUTH CAROLINA.

INTRODUCTION.

The object of the investigation, the results of which are presented in the following working plan, was primarily to determine how much timber is at present standing on the land of the E. P. Burton Lumber Company, how much is necessary for a sustained annual yield equal to the present capacity of the company's mill, and in what way the largest successive crops can be obtained in the shortest time and at the least expense. It led to the conclusion that the prevailing species (loblolly pine), the method of logging, and the location of the tract are all adapted to make the pine lands permanently valuable if treated in such a way as to insure future crops of timber. The swamp lands do not offer the same favorable opportunities for forest management. Here the most important species, cypress, occurs only as scattered individuals, or at best in small groups, surrounded by a luxuriant growth of hardwoods which prevents its reproduction on a large scale. The improvement of these lands will therefore be slow.

The work of collecting data on which to base recommendations for the treatment of this tract took a crew of six men three and one-half months, and embraced the following measurements:

(1) The measurement of all hardwoods to 10 inches and all softwoods to 2 inches in diameter breasthigh over approximately 5 per cent of the tract.

(2) The measurement of 1,545 felled trees for volume.

(3) The measurement of 3,107 stumps for rate of growth.

(4) The measurement of 4,102 trees for total height and clear length.

The standing trees were measured throughout the various holdings in strips 66 feet wide and one-fourth mile apart. The diameters of the trees were recorded on sheets which showed for each acre the number of trees of each species and their diameters. The measurement of felled trees followed the logging and included:

Height of stump.

Diameter of stump inside and outside of bark.

Diameter 4½ feet from the ground.

Diameter at the top of each log inside and outside of bark.

Total height.

Clear length or distance from the ground to the first large limb.

From these measurements volume tables were constructed which show the merchantable contents for trees of different diameters.

Measurements of diameter growth were taken on the stump only. The annual rings were counted along an average radius, and the diameter growth for each ten years was thus secured. The rate of growth of hardwoods, of species of pine whose occurrence was too infrequent to be of importance, and of cypress, of which no trees suitable for such measurements were available, was not obtained.

PART I.—THE TIMBERLANDS.

GENERAL DESCRIPTION OF TRACT.

The tract of timberland owned by the E. P. Burton Lumber Company is situated in Berkeley County, S. C., between the Cooper and Santee rivers, and is made up of holdings which still retain the names of their former owners. The holdings vary in size from 599 acres to 20,213 acres. The total area of all lands controlled is 44,943 acres. Of this 5,243 acres are cultivated and waste lands, and 39,700 acres timbered. On 10,158 acres of the latter the company owns only stumpage. Adverse holdings, aside from those on which stumpage is owned, are insignificant, comprising only a few small lots of from 10 to 100 acres each. Except for these adverse holdings the tract forms a solid block.

The land is uniformly flat, but may be divided into uplands and swamps. Small sink holes, or "pocosons," are scattered all over the uplands. The swamps, of which Hell Hole is the largest, are but little lower than the flat uplands. Their area is approximately 13,000 acres, or nearly one-third of the total timbered area.

The soil varies from a nearly pure sand in the northwestern part of the tract to a sandy loam with an admixture of clay in the southern and eastern parts. The swamps have a uniformly wet, deep, sandy loam, which in a few instances becomes mucky. Over a few areas the soil seems physically unsuited to tree growth, but generally soil conditions are excellent.

There is no outcropping of rock throughout the tract.

Small runs or streams are plentiful. The principal ones are Turkey and Nicholson runs, which form the headwaters of the east branch of Cooper River and drain the southern portion of Hell Hole Swamp. Savannah Creek, which flows into the Santee River, drains the northern part of Hell Hole.

The tract is accessible by roads which traverse it in all directions. These roads are good in dry weather, but in wet weather they become almost useless for hauling; since, however, the logging is done almost entirely by rail, wagon roads are of minor importance. (See map at end of volume.)

THE FOREST TYPES.

The forest lands of this region are divided, by differences in topography and composition of stand, into three broad types—loblolly pine land, longleaf pine land, and swamp land. The latter may be further subdivided into bottomlands and true swamps.

The dividing line between loblolly and longleaf pine land is not well defined, since the two species occur more or less in mixture on both types. The swamp land, being a topographic type, has well-defined boundaries. The percentage of each type of land over the whole tract, as determined from the valuation surveys and map, is as follows:

	Per cent.
Loblolly pine land	34
Longleaf pine land	33
Swamp land	33
Total	100

LOBLOLLY PINE LAND.

Loblolly pine land occupies the fresh and moist uplands, extending in places into the bottoms. It stands first among the types both in area and in commercial importance.

The soil on this land is a light, sandy loam, with a considerable admixture of clay over occasional areas. Humus, except in wet places, is almost entirely wanting. This is because fires pass over the land so frequently that humus has no chance to form. The ground is covered with a growth of tall grass and broom sedge, which affords pasturage for a considerable number of cattle.

The amount of underbrush varies greatly; over large areas there is practically none, while in places it is dense. It consists of such species as gall berry, red and white bay, wax myrtle, sprouts of gums and oaks, and raspberry bushes. Red and white bay form the typical underbrush on swamp land, while gall berry and wax myrtle are found mainly on the pine lands. As a rule, underbrush increases in direct proportion to the amount of moisture present.

Loblolly pine occurs both in pure stands and in mixture with longleaf pine and hardwoods. Over the bulk of the land, however, some longleaf is mixed with the loblolly, while hardwoods, in the form of an understory, are nearly always present.

The stands in this forest type tend to be even aged. Where land formerly under cultivation has come up to loblolly pine, the trees are of uniform size and the range in age is small; but where land has always been under forest the trees vary greatly in age, approaching in this respect a selection forest.

The understory of hardwoods which loblolly pine lands generally support may be dense or very open, according to moisture conditions. Where there is plenty of moisture in the soil, red gum, black gum, water oak, red maple, and occasionally yellow poplar, ash, beech, and hickory form the hardwood growth, while on the drier soils scrubby blackjack, black, Spanish, and post oaks occur.

Reproduction of loblolly pine in this forest type is limited only by the occurrence of forest fires. Wherever fire has been kept out for a short period, reproduction is plentiful. For this reason it is best

on the moist situations. But on the drier soils reproduction has had very little opportunity to establish itself. Good reproduction has taken place on cut-over loblolly pine lands wherever sufficient seed trees have been left.

Over the greater part of the area loblolly pine is thrifty, and at present is putting on fair growth. In some places, however, the trees are either overmature or badly burned out at the base, or both, and windfalls are very common.

Although the present loblolly pine forest is in excellent condition, by the judicious cutting of the present crop and by protection from fire the future forest can be made to produce still more timber and to give proportionally better returns.

Table I shows the representation of species on loblolly pine land.

TABLE I.—*Stand on loblolly pine land.*

[Softwoods and yellow poplar calipered to 2 inches and other hardwoods to 10 inches in diameter breasthigh on 757 acres.]

Diameter breasthigh.	Average number of trees per acre.																	
	Loblolly pine.	Cypress.	Longleaf pine.	Black gum.	Red gum.	Dead pine.	Black oak.	Red maple.	White oak.	Shortleaf pine.	Yellow poplar.	Beech.	Hickory.	Ash.	Cedar.	Elm.	Spruce pine.	Persimmon.
Inches.																		
2	6.43	3.34	0.31	....	....	0.01	....	....	....	0.03	0.01	....	....	....	0.01	....	0.01	....
3	4.57	2.74	.36	....	....	.04	....	....	....	.03	.02	....	....	....	.02	....	.01	....
4	4.25	2.71	.48	....	....	.07	....	....	....	.04	.04	....	....	....	.02	....	....	....
5	4.06	2.06	.52	....	....	.08	....	....	....	.04	.03	....	....	....	.02	....	....	....
6	3.60	1.61	.54	....	....	.12	....	....	....	.04	.05	....	....	....	.02	....	.01	....
7	2.95	.95	.43	....	....	.10	....	....	....	.04	.04	....	....	....	.01	....	....	....
8	3.40	.88	.42	....	....	.11	....	....	....	.06	.04	....	....	....	.02	....	.01	....
9	2.86	.73	.40	....	....	.12	....	....	....	.04	.03	....	....	....	.01	....	....	....
10	3.26	.66	.41	0.64	0.39	.14	0.25	0.18	0.10	.04	.04	0.04	0.05	0.04	.02	0.02	....	0.01
11	2.78	.49	.35	.42	.36	.09	.22	.12	.11	.03	.03	.03	.04	.04	.03	.02	....	....
12	3.01	.54	.38	.41	.38	.11	.20	.12	.07	.04	.03	.04	.04	.02	.02	.02	....	....
13	2.69	.52	.34	.28	.28	.09	.16	.09	.06	.04	.02	.03	.03	.02	.01	.01	....	....
14	2.54	.38	.32	.27	.24	.08	.12	.06	.05	.03	.02	.03	.02	.04	.01	....	....	....
15	2.30	.38	.27	.19	.24	.07	.10	.05	.06	.03	.01	.03	.01	.01	.01	.01	....	....
16	1.92	.28	.24	.15	.18	.05	.09	.05	.03	.01	.01	.02	.01	.02	....	....	.01	....
17	1.77	.25	.16	.11	.13	.07	.06	.03	.03	....	.01	.03	.01	.01	....	....	....	....
18	1.71	.19	.14	.10	.11	.05	.04	.04	.02	....	....	.01	.01	.01	....	....	....	....
19	1.36	.13	.07	.07	.07	.03	.04	.02	.02	....	.01	.01	.01	.01	....	....	....	....
20	1.36	.15	.06	.06	.05	.04	.03	.01	.02	....	.01	.01	....	....	....	....	....	....
21	1.12	.12	.04	.03	.05	.03	.03	.01	.01	....	....	.01	.01	....	....	....	....	....
22	.96	.10	.03	.03	.03	.03	.02	....	.01	....	....	....	.01	.01	....	....	....	....
23	.65	.05	.02	.02	.02	.02	.01	.01	.01	....	....	....	....	....	....	....	....	....
24	.64	.05	.02	.01	.02	.01	.02	.01	....	....	.01	....	....	....	....	....	....	....
25	.41	.03	.01	.01	.01	.02	.02	....	....	....	.01	....	....	....	....	....	....	....
26	.32	.04	.01	....	.01	.01	.01	....	.01	....	....	....	....	....	....	....	....	....
27	.24	.02	....	....	.01	.01	.01	....	.01	....	....	....	....	....	....	....	....	....
28	.17	.02	....	....	....	.01	....	....	....	....	....	....	....	....	....	....	....	....
29	.10	.01	....	....	....	.01	.01	....	....	....	....	....	....	....	....	....	....	....
30	.07	....	....	....	....	.01	....	....	....	....	....	....	....	....	....	....	....	....
31	.06	.01	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
32	.03	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
33	.03	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
34	.03	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
35	.01	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
36	.02	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
37	.01	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Total	61.69	19.44	6.33	2.80	2.58	1.63	1.44	.80	.62	.54	.47	.29	.25	.23	.23	.08	.05	.01
2″ to 9″	32.12	15.02	3.46	....	....	.65	....	....	....	.32	.26	....	....	....	.13	....	.04	....
Per cent	61.77	28.88	6.65	....	....	1.25	....	....	....	.62	.50	....	....	....	.25	....	.08	....
10″ and over	29.57	4.42	2.87	2.80	2.58	.98	1.44	.80	.62	.22	.21	.29	.25	.23	.10	.08	.01	.01
Per cent	62.28	9.31	6.05	5.89	5.43	2.06	3.03	1.68	1.31	.47	.44	.61	.53	.49	.21	.17	.02	.02

LONGLEAF PINE LAND.

Longleaf pine is confined, in the main, to the higher situations and to the drier and lighter soils. It is most prevalent in the northern and eastern portions of the tract. On the drier parts of loblolly pine lands the two types mingle. Soils of longleaf pine land vary from pure white sands to sandy loams with an admixture of clay; either class of soil seems well fitted for the growth of the tree.

Here again humus is nearly wanting on account of the yearly ground fires, which, favored by a thick growth of grass, seldom fail to overrun these lands. Underbrush, while not so plentiful as on loblolly pine land, is often present. It consists chiefly of gall berry, hardwood sprouts, wax myrtle, and sometimes raspberry bushes.

Longleaf pine occurs on this type either in pure stands or mixed with loblolly pine and hardwoods. Loblolly pine, however, is nearly always present. The small sink holes or pocosons in the midst of longleaf pine land, where moisture is more plentiful, are invariably fringed with loblolly pine. Small patches of loblolly pine often become established on longleaf land simply because loblolly has been able to seed up such areas first. Hardwoods are less prevalent than on loblolly land. They are for the most part very small and stunted, and are composed largely of such species as Spanish, blackjack, black, and post oaks.

Longleaf pine occurs in even-aged stands, but these stands are apt to take the form of small groups, and seldom exceed a few acres in area. The forest cover is therefore much broken, and as cutting has taken place over the bulk of these lands, the stand is often very open.

This type of forest has been mismanaged more than any other on the tract. Lumbering has removed the bulk of the large trees, and 57 per cent of all the longleaf pines 10 inches and over in diameter has been boxed for turpentine. As a result of this lumbering and boxing, fires have been able to kill many of the trees left standing and largely to prevent renewal of the forest. Consequently there are now large areas over which the stand is so open that it is doubtful if it could be lumbered with profit. In spite of the fact that young growth has occasionally come in so that the prospects for a second crop over limited areas are excellent, reproduction throughout this type as a whole is nearly wanting; seedlings are more scarce than saplings or poles. If fire were kept out, however, reproduction would establish itself.

Table II shows the representation of species on the longleaf pine lands.

TABLE II.—*Stand on longleaf pine land.*

[Softwoods and yellow poplar calipered to 2 inches and other hardwoods to 10 inches in diameter breasthigh on 755 acres.]

Diameter breasthigh.	Average number of trees per acre.											
	Longleaf pine.	Loblolly pine.	Cypress.	Dead pine.	Black gum.	Black oak.	Red gum.	Shortleaf pine.	White oak.	Red maple.	Hickory.	Ash.
Inches.												
2	5.88	2.98	1.30	0.01	.....	.....	.....	0.01	.....	.....	.....	.....
3	6.13	2.50	.72	.02	.....	.....	.....	.01	.....	.....	.....	.....
4	7.59	2.67	.65	.05	.....	.....	.....	.01	.....	.....	.....	.....
5	7.44	2.44	.44	.07	.....	.....	.....	.02	.....	.....	.....	.....
6	6.45	2.13	.30	.06	.....	.....	.....	.01	.....	.....	.....	.....
7	5.19	1.42	.16	.06	.....	.....	.....	.01	.....	.....	.....	.....
8	5.36	1.34	.17	.08	.....	.....	.....	.01	.....	.....	.....	.....
9	4.59	1.03	.16	.07	.....	.....	.....	.01	.....	.....	.....	.....
10	4.17	.96	.15	.09	0.22	0.03	0.05	.01	0.02	0.01	0.01	.....
11	3.38	.85	.12	.07	.11	.03	.04	.01	.02	.01	.....	0.01
12	3.14	.76	.12	.14	.12	.04	.04	.01	.02	.01	.01	.....
13	2.42	.70	.09	.16	.07	.04	.03	.....	.01	.01	.....	.....
14	2.07	.76	.08	.13	.05	.01	.01	.01	.01	.01	.01	.....
15	1.64	.58	.08	.17	.05	.02	.02	.01	.....	.01	.01	.01
16	1.35	.47	.06	.16	.04	.02	.01	.....	.01	.01	.....	.....
17	.97	.42	.04	.12	.04	.01	.01	.....	.01	.....	.....	.....
18	.66	.37	.03	.10	.03	.01	.01	.....	.....	.....	.....	.....
19	.39	.27	.02	.08	.02	.01	.....	.....	.....	.....	.....	.....
20	.30	.24	.03	.07	.01	.01	.01	.....	.....	.....	.....	.....
21	.16	.25	.02	.06	.01	.01	.....	.....	.....	.....	.....	.....
22	.12	.19	.02	.05	.....	.....	.....	.....	.....	.....	.....	.....
23	.07	.15	.01	.03	.....	.....	.....	.....	.....	.....	.....	.....
24	.06	.11	.01	.02	.....	.....	.....	.....	.....	.....	.....	.....
25	.04	.07	.01	.02	.....	.....	.....	.....	.....	.....	.....	.....
26	.02	.04	.....	.01	.....	.....	.....	.....	.....	.....	.....	.....
27	.01	.03	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
28	.02	.02	.01	.....	.....	.....	.....	.....	.....	.....	.....	.....
29	.01	.01	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
30	.01	.01	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
31	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
32	.....	.01	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	69.64	23.78	4.80	1.91	.77	.24	.23	.14	.10	.07	.04	.02
2″ to 9″	48.62	16.51	3.90	.42	.....	.....	.....	.09	.....	.....	.....	.....
Per cent	69.92	23.74	5.61	.60	.....	.....	.....	.13	.....	.....	.....	.....
10″ and over	21.02	7.27	.90	1.49	.77	.24	.23	.05	.10	.07	.04	.02
Per cent	65.29	22.58	2.78	4.63	2.39	.75	.71	.16	.31	.22	.12	.06

SWAMP LAND.

This type comprises about 13,000 acres, or approximately one-third of the total wooded area of the tract. The most important swamps are Hell Hole and Darrington. The others are smaller and contain less valuable timber. The swamps are practically virgin forest land, the only lumbering ever done having been the removal of a few cypress trees for shingles. The composition of the stands varies greatly in the two subtypes—bottomlands and true swamps.

Bottomlands.—Bottomlands occur principally along the borders of the true swamps and along streams. The area of this type is comparatively small and the species composing the stand of timber are less valuable.

The soil of the bottomlands is the best in the region. It is sometimes wet, but generally moist to fresh. In composition it is a sandy loam. The humus is made up of decayed hardwood leaves and needles and is medium to deep.

The amount of underbrush varies greatly. In places it is dense, consisting of rattan, smilax, and wax myrtle; in other instances it is almost totally lacking. Grass occurs here but sparingly, and the lands are of small value for grazing.

In the bottomland type of forest a large number of species occur. Here maple, ash, beech, red, white, black, Spanish, and water oaks, hickory, elm, pond pine, and red gum reach their best development. Loblolly pine also grows well.

Few of the above-mentioned species are at present cut, and many do not occur in sufficient quantities to be worth removing. The loblolly and pond pine will be cut. Maple, ash, hickory, white and red oak, and red gum could probably be removed with profit at the same time, thus making room for reproduction of loblolly pine and the great increase in the future value of the forest.

The trees are of all ages and diameters. Saplings and poles of all the species are much more plentiful than seedlings, which are generally very scarce.

Fire occurs on this forest type only during extremely dry seasons, and as such seasons do not usually occur more often than once every ten years, little damage has resulted from this source.

True swamps.—The true swamps occupy the low-lying lands, where, except in occasional very dry seasons, there is standing water the year round. The soil is deep and rich, but very wet. It varies from sandy loam to heavy muck; the latter, however, occurs only over small areas. Properly drained, these lands would be valuable for agricultural purposes. Humus is deep but not well decayed, for the standing water retards its decomposition. Over this layer of humus is a thick mat of leaves and needles, decaying slowly under water. Underbrush is nearly always present in the true swamps. It occurs on tussocks raised above the water, and consists of hurrah brush, red and white bay, smilax, rattan, and holly. These tussocks also bear one or more trees each.

The forest is made up of a large number of species. The commonest are cypress, loblolly and pond pine, black and red gum, maple, water oak, yellow poplar, and ash. With the exception of cypress, none of these trees prefers the class of land found in this type; all of them grow to better advantage on drier situations. The trees of chief commercial importance are cypress, loblolly pine, and yellow poplar.

Cypress occurs in groups or as scattered individuals throughout the type, and reaches larger size than any other species found on the tract. Loblolly pine also is of irregular occurrence. It seeks the higher places, and is found either on small islands or on tussocks, while cypress often grows in the water. Notwithstanding their scattered occurrence, these two species make up the bulk of the merchantable stand throughout the true swamps. Yellow poplar occurs only in a few small groups, and if it were not for its large size would be of no importance.

Reproduction throughout this forest type is scarce and poorly distributed. Small patches of cypress seedlings, however, are sometimes found, and loblolly reproduction is occasionally dense along the edge of a swamp. Saplings and poles of cypress, loblolly pine, yellow poplar, and the hardwoods are much more common than seedlings, but on account of the dense shade they are apt to be poor, suppressed specimens.

Table III shows the representation of species on the true swamps and bottomlands combined.

TABLE III.—*Stand on swamp and bottomland.*

[Soft woods and yellow poplar calipered to 2 inches and other hardwoods to 10 inches in diameter breasthigh on 599 acres.]

Diameter breasthigh.	Average number of trees per acre.																
	Cypress.	Loblolly pine.	Black gum.	Red maple.	Red gum.	Black oak.	Yellow poplar.	Ash.	Dead pine.	Longleaf pine.	White oak.	Cedar.	Elm.	Hickory.	Beech.	Holly.	Sweet magnolia.
Inches.																	
2	5.11	2.87					0.02		0.03	0.08		0.03					
3	5.34	1.99					.03		.04	.02		.04					
4	6.66	2.00					.05		.05	.03		.03					
5	7.07	1.80					.06		.08	.03		.03					
6	5.87	1.53					.07		.03	.02		.04					
7	4.01	1.16					.08		.06	.02		.02					
8	4.36	1.41					.05		.04	.03		.02					
9	3.00	1.26					.05		.05	.02		.02					
10	3.07	1.34	5.34	1.20	0.39	0.32	.07	0.19	.04	.03	0.06	.01	0.04	0.03	0.02	0.02	0.02
11	1.85	1.08	3.02	.59	.32	.25	.06	.15	.02	.02	.03	.01	.04	.02	.01	.02	.01
12	2.18	1.22	3.36	.81	.36	.25	.05	.12	.03	.03	.03	.01	.03	.02	.02	.01	.01
13	1.44	1.04	2.50	.51	.33	.23	.07	.11	.02	.03	.04	.01	.02	.02	.01		
14	1.41	1.15	2.31	.48	.32	.18	.05	.08	.02	.04	.04		.03	.01	.01		
15	1.20	1.07	1.90	.41	.29	.18	.04	.07	.03	.05	.02	.01	.02	.02	.02		
16	.87	1.06	1.39	.36	.25	.14	.04	.04	.02	.04	.03		.01	.01	.01		
17	.82	1.10	1.23	.33	.21	.12	.04	.03	.02	.01	.03		.01	.01	.01		
18	.63	1.22	.90	.25	.16	.12	.03	.03	.03	.02	.02		.01		.01		
19	.47	.99	.57	.17	.14	.09	.02	.03	.03	.01	.01		.01	.01	.01		
20	.52	.98	.47	.16	.14	.09	.04	.02	.02	.01	.01		.01				
21	.37	.89	.30	.10	.09	.08	.02	.02	.01	.01	.01			.01	.01		
22	.33	.81	.24	.08	.08	.04	.02		.02		.02			.01			
23	.27	.72	.12	.04	.05	.04	.02	.01	.01		.01						
24	.21	.54	.11	.03	.05	.05	.02										
25	.22	.42	.08	.03	.03	.03	.01		.01					.01			
26	.15	.30	.05	.01	.03	.02	.01		.01		.01						
27	.12	.25	.03	.01	.02	.02	.01				.01						
28	.11	.15	.02	.01	.02	.01	.01										
29	.08	.13	.02		.01		.01										
30	.08	.09	.01	.01	.01	.01	.01				.01						
31	.04	.05	.01		.01	.01											
32	.04	.04	.01		.01						.01						
33	.04	.03				.01											
34	.03	.01															
35	.04	.01					.01										
36	.03	.01			.01		.01										
37	.01	.01															
38	.02																
39	.01																
40	.02																
41	.01																
42																	
43	.01																
44	.01																
45	.01																
Total	58.14	30.73	23.99	5.59	3.33	2.29	1.08	.90	.72	.55	.40	.28	.23	.18	.14	.05	.04
2″ to 9″	41.42	14.02					.41		.38	.25		.23					
Per cent	73.03	24.71					.74		.67	.44		.41					
10″ and over	16.72	16.71	23.99	5.59	3.33	2.29	.67	.90	.34	.30	.40	.05	.23	.18	.14	.05	.04
Per cent	23.24	23.23	33.35	7.77	4.64	3.18	.93	1.25	.48	.41	.56	.07	.32	.25	.19	.07	.06

WASTE LAND.

There are large areas in the Cooper River holdings of the E. P. Burton Lumber Company which bear a very open growth of trees of small size and poor quality. The largest of these areas is in the eastern part of the Hell Hole tract, and contains 2,635 acres. This area, termed the Big Savannah, may be taken as a type of all bays and savannahs. Water stands on a great part of these savannahs most of the year. The Big Savannah bears an open growth of small pond pines, 35 to 40 feet tall and 6 to 10 inches in diameter, and from 50 to 60 years old. Mixed with the pines, along the edge of the savannah, are small black gums and cypresses. These come up in dense thickets, and form, with the underbrush, which is thickest here, an almost impassable hedge or border. The underbrush of the savannahs is composed of hurrah brush, titi, smilax, devilwood, loblolly, white and red bay, and holly. It grows on tussocks raised above the water, as do the trees, and this often leaves passageways through the dense growth. Grass covers the ground wherever the area is clear of brush, so that the land has some value for grazing.

The soil on this area is a white sand. It is covered with a layer of partially decayed vegetable matter 12 to 15 inches deep. Why it bears no merchantable timber is not accurately known. An analysis of the soil made by the Bureau of Soils, United States Department of Agriculture, showed it minerally capable of tree growth of good character. The explanation must therefore be sought in its physical properties, which, however, are not very different from those of other samples from areas which bear excellent timber.

VOLUME AND YIELD.

VOLUME TABLES FOR LOBLOLLY PINE, LONGLEAF PINE, AND CYPRESS.

Table IV shows the number of board feet obtainable from sound loblolly pine, longleaf pine, and cypress trees of different diameters, according to the two-thirds log rule. These tables are compiled from the scalings of 1,002 felled loblolly pine trees, 278 longleaf pine trees, and 265 cypress trees, and are the tables used in determining the number of board feet in standing trees over the tract.

The volume of hardwoods was obtained from tables made in other localities, which will not, therefore, appear in this report.

TABLE IV.—*Volumes of loblolly pine, longleaf pine, and bald cypress.*

Diameter breast-high.	Loblolly pine.	Longleaf pine.	Cypress.	Diameter breast-high.	Loblolly pine.	Longleaf pine.	Cypress.	Diameter breast-high.	Loblolly pine.	Longleaf pine.	Cypress.
Inches.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Inches.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Inches.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
10.....	68	60	64	24.....	599	515	500	38.....	1,479	.....	1,259
11.....	87	80	84	25.....	649	555	555	39.....	1,560	.....	1,312
12.....	109	100	105	26.....	699	597	610	40.....	1,641	.....	1,369
13.....	134	124	127	27.....	750	640	667	41.....	.....	.....	1,424
14.....	163	150	150	28.....	803	688	720	42.....	.....	.....	1,480
15.....	194	178	174	29.....	859	735	775	43.....	.....	.....	1,538
16.....	230	210	200	30.....	917	779	830	44.....	.....	.....	1,591
17.....	270	243	228	31.....	978	823	881	45.....	.....	.....	1,649
18.....	313	280	258	32.....	1,040	870	935	46.....	.....	.....	1,701
19.....	360	315	289	33.....	1,110	915	990	47.....	.....	.....	1,759
20.....	405	357	322	34.....	1,180	964	1,040	48.....	.....	.....	1,815
21.....	453	398	361	35.....	1,250	1,010	1,094	49.....	.....	.....	1,872
22.....	500	437	403	36.....	1,323	.....	1,150	50.....	.....	.....	1,930
23.....	550	476	450	37.....	1,400	.....	1,203				

THE YIELD BY BLOCKS.

With the exception of Hell Hole, none of the Cooper River holdings are of great area. Within them there are, however, great differences in stands of timber and in composition of the forest. For this reason the holdings were subdivided into blocks, each of which contains, so far as possible, a uniform stand of timber of like composition. No block extends from one holding into another, and, when possible to avoid it, no swamp land was included in the same block with upland. A combination of the upland or swamp land blocks in any holding will give the total yield of timber on upland or swamp land for that holding, and by a combination of those of either kind on all blocks the same can be ascertained for the whole tract.

The yield of timber is estimated for each block separately. Table No. V shows the stand in board feet of the most important species 10 inches and over in diameter breasthigh, by blocks and holdings, and Table No. VII shows the same for the whole tract. In order to give a more accurate idea of the quality and size of the merchantable timber on the tract, the yield of cypress, pines, and yellow poplar is computed in Table No. VI for trees between different diameters in each block and holding.

No tables of volume for ash, maple, and hickory being available, the yield of these species could not be computed. Table No. VIII gives the number of trees of each diameter for these species over the whole tract.

The yield of pine and cypress shown in the following tables is based upon the two-thirds log rule, the yield of other species upon the Doyle. Table No. IX shows the relation these two rules bear to each other.

No deduction for cull is made in the tables; this figure can best be supplied by the company.

The map accompanying this report shows the division into blocks and also the yield per acre of pines and cypress. The average diameter and percentage of longleaf pine, loblolly pine, and cypress is also

indicated by symbols. By using this map in connection with the yield tables, a fairly accurate idea of the timber on any part of the tract may be obtained.

TABLE V.—*Yield from trees 10 inches and over in diameter breasthigh.*

HELL HOLE.

Number of block.	Area.	Loblolly pine.		Longleaf pine.		Cypress.		Yellow poplar.	
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.
	Acres.	*Bd. feet.*	*Bd. feet.*	*Bd. feet.*	*Bd. feet.*	*Bd. feet.*	*Bd. feet.*	*Bd. feet.*	*Bd. feet*
I	3,317.4	3,382	11,219,447	1,602	5,314,475	113	374,866	24	75,618
II	2,264.8	4,876	11,043,165	209	473,343	2,698	6,110,430	435	985,188
III	1,377.6	7,510	10,345,776	1,350	1,859,760	1,044	1,438,214	234	322,358
IV	2,406.8	4,725	11,372,130	48	115,526	4,584	11,032,771	325	782,210
V	581.6	11,093	6,451,689	635	369,316	2,690	1,564,504	166	96,546
VI	366.8	13,481	44,944,831	.....	.....	876	321,317	163	59,788
VII	405.6	13,428	5,446,397	.....	.....	1,166	472,930	.....	.....
VIII	1,087.6	5,116	5,564,162	.....	.....	5,008	5,446,701	.....	.....
IX	1,751.6	8,764	15,351,022	24	42,038	4,391	7,691,276	10	17,516
X	1,029.6	7,255	7,469,748	.....	.....	2,950	3,037,320	.....	.....
XI	812.0	10,181	8,266,972	510	414,120	2,257	1,832,684	.....	.....
XII	1,175.6	5,999	7,052,424	.....	.....	1,652	1,942,091	.....	.....
XIII	449.6	3,846	1,729,162	.....	.....	1,346	605,162	.....	.....
XIV	430.8	4,680	2,016,144	1,585	682,818	340	146,472	.....	.....
Total	17,457.4	.....	108,273,069	.....	9,271,396	.....	42,016,738	.....	2,343,224

Number of block.	Area.	Red gum.		Black gum.		Black oak.		White oak.		All species.
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Total yield by blocks.
	Acres.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
I	3,317.4	49	162,553	226	749,732	37	122,744	4	13,270	18,036,705
II	2,264.8	672	1,521,946	1,483	3,358,698	470	1,064,456	249	563,935	25,121,161
III	1,377.6	80	110,208	337	464,251	123	169,445	35	48,216	14,758,228
IV	2,406.8	95	228,646	3,319	7,988,169	86	206,985	.....	.....	31,726,437
V	581.6	67	38,967	466	271,026	16	9,306	.....	.....	8,801,354
VI	366.8	101	37,047	410	150,388	76	27,877	.....	.....	5,541,248
VII	405.6	33	13,385	169	68,546	52	21,091	43	17,441	6,039,790
VIII	1,087.6	8	8,701	2,153	2,341,603	1	1,088	.....	.....	13,362,255
IX	1,751.6	31	54,300	2,957	5,179,481	106	185,670	1	1,752	28,523,055
X	1,029.6	7	7,207	487	501,415	20	20,592	.....	.....	11,036,282
XI	812.0	.....	.....	121	98,252	9	7,308	.....	.....	10,619,336
XII	1,175.6	.....	.....	35	41,146	3	3,527	.....	.....	9,039,188
XIII	449.6	8	3,597	502	225,699	.....	.....	.....	.....	2,563,620
XIV	430.8	36	15,509	178	76,682	255	109,854	20	8,616	3,056,095
Total	17,457.4	.....	2,202,066	.....	21,515,088	.....	1,949,943	.....	653,230	188,224,754

CHAPEL HILL.

Number of block.	Area.	Loblolly pine.		Longleaf pine.		Cypress.		Yellow poplar.	
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.
	Acres.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
I	1,208.6	2,132	2,576,735	2,990	3,613,714	816	986,218	.....	.....
II	871.2	8,917	7,768,490	10	8,712	2,587	2,210,234	1	871
III	127.4	10,630	1,354,262	574	73,128	1,773	225,880	.....	.....
IV	613.4	10,894	6,682,380	1,481	908,445	1,338	820,729	8	4,907
V	241.0	5,512	1,328,392	.....	.....	1,088	262,208	.....	.....
Total	3,061.6	.....	19,710,259	.....	4,603,599	.....	4,505,269	.....	5,778

TABLE V.—*Yield from trees 10 inches and over in diameter breasthigh*—Continued.

CHAPEL HILL—Continued.

Number of block.	Area.	Red gum.		Black gum.		Black oak.		White oak.		All species.
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Total yield by blocks.
	Acres.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
I	1,208.6	3	3,626	44	63,178	.....	.....	.....	.....	7,233,471
II	871.2	37	32,234	1,050	914,760	8	6,970	.....	87,120	11,029,391
III	127.4	37	4,714	193	24,588	.....	.....	.....	.....	1,682,572
IV	613.4	131	80,355	132	80,969	19	11,655	.....	.....	8,589,440
V	241.0	266	64,106	1,945	468,745	30	7,230	7	1,687	2,132,368
Total	3,061.6	.....	185,035	.....	1,542,240	.....	25,855	.....	88,807	30,667,242

BATES.

Number of block.	Area.	Loblolly pine.		Longleaf pine.		Cypress.		Yellow poplar.	
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.
	Acres.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
I	2,478.0	5,529	18,700,862	2,882	7,141,596	1,098	2,720,844	1	2,478
II	737.8	4,562	3,365,844	30	22,134	2,761	2,037,066	412	303,974
Total	3,215.8	.....	17,066,706	.....	7,163,730	.....	4,757,910	.....	306,452

Number of block.	Area.	Red gum.		Black gum.		Black oak.		White oak.		All species.
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Total yield by blocks.
	Acres.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
I	2,478.0	54	133,812	320	792,960	59	146,202	2	4,956	24,643,710
II	737.8	596	439,729	906	668,447	1,231	908,232	86	63,451	7,808,877
Total	3,215.8	.....	573,541	.....	1,461,407	.....	1,054,434	.....	68,407	32,452,587

RIVERS.

Number of block.	Area.	Loblolly pine.		Longleaf pine.		Cypress.		Yellow poplar.	
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.
	Acres.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
I	855.2	2,329	1,991,761	3,322	2,840,974	380	324,976	.....	.....
II	144.2	7,191	1,036,942	1,543	222,501	1,513	218,175	.....	.....
Total	999.4	.....	3,028,703	.....	3,063,475	.....	543,151	.....	.....

TABLE V.—*Yield from trees 10 inches and over in diameter breasthigh*—Continued.

RIVERS—Continued.

Number of block.	Area.	Red gum.		Black gum.		Black oak.		White oak.		All species.
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Total yield by blocks.
	Acres.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
I	855.2	.....	.....	13	11,118	4	3,421	.....	.....	5,172,250
II	144.2	.....	.....	187	26,965	9	1,298	.....	.....	1,505,881
Total	999.4	.....	.....	.....	38,083	.....	4,719	.....	.....	6,678,131

McCABE AND INABINETT.

Number of block.	Area.	Loblolly pine.		Longleaf pine.		Cypress.		Yellow poplar.	
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.
	Acres.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd ft.*
I	1,972.8	4,359	8,599,435	1,120	2,209,536	920	1,814,976	.....	.....
II	239.2	6,960	1,664,832	148	35,402	2,912	696,550	414	99,029
III	632.4	6,757	4,273,127	1,940	1,226,856	811	512,876	.....	.....
Total	2,844.4	.....	14,537,394	.....	3,471,794	.....	3,024,402	.....	99,029

Number of block.	Area.	Red gum.		Black gum.		Black oak.		White oak.		All species.
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Total yield by blocks.
	Acres.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
I	1,972.8	18	35,510	163	321,566	23	45,374	14	27,619	13,054,016
II	239.2	59	14,113	2,031	485,815	473	113,142	5	1,196	3,110,079
III	632.4	31	19,604	106	67,034	22	13,913	.....	.....	6,113,410
Total	2,844.4	.....	69,227	.....	874,415	.....	172,429	.....	28,815	22,277,505

HILL.

Number of block.	Area.	Loblolly pine.		Longleaf pine.		Cypress.		Yellow poplar.	
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.
	Acres.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
I	1,696.8	2,344	3,977,299	1,614	2,738,635	281	476,801	.....	.....
II	175.6	7,354	1,291,362	208	36,525	600	105,360	.....	.....
III	125.6	1,583	198,825	39	4,898	357	44,839	.....	.....
Total	1,998.0	.....	5,467,486	.....	2,780,058	.....	727,000	.....	.....

TABLE V.--*Yield from trees 10 inches and over in diameter breasthigh*—Continued.

HILL—Continued.

Number of block.	Area.	Red gum.		Black gum.		Black oak.		White oak.		All species.
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Total yield by blocks.
	Acres.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
I	1,696.8	134	227,371	119	201,919	100	169,680	31	52,601	7,844,306
II	175.6	517	90,785	941	165,240	258	45,305	40	7,024	1,741,601
III	125.6	1,771	222,438	100	12,560	1,092	137,155	331	41,574	662,289
Total	1,998.0	.....	540,594	.....	379,719	.....	352,140	.....	101,199	10,248,196

FISHBROOK.

Number of block.	Area.	Loblolly pine.		Longleaf pine.		Cypress.		Yellow poplar.	
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.
	Acres.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
I	1,128.6	2,384	2,690,582	595	671,517	11	12,415	1	1,129
II	575.4	2,980	1,714,692	.....	.....	759	436,729	48	27,619
Total	1,704.0	.....	4,405,274	.....	671,517	.....	449,144	.....	28,748

Number of block.	Area.	Red gum.		Black gum.		Black oak.		White oak.		All species.
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Total yield by blocks.
	Acres.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
I	1,128.6	455	513,513	23	25,958	270	304,722	68	76,745	4,296,581
II	575.4	2,263	1,302,130	131	75,377	784	451,114	255	146,727	4,154,388
Total	1,704.0	.....	1,815,643	.....	101,335	.....	755,836	.....	223,472	8,450,969

WINDSOR.

Number of block.	Area.	Loblolly pine.		Longleaf pine.		Cypress.		Yellow poplar.	
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.
	Acres.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
I	870.4	2,517	2,190,797	423	368,179	36	31,334	71	61,798
II	137.2	1,769	242,707	.....	.....	1,048	143,786	.....	.....
Total	1,007.6	.....	2,433,504	.....	368,179	.....	175,120	.....	61,798

TABLE V.—*Yield from trees 10 inches and over in diameter breasthigh*—Continued.

WINDSOR—Continued.

Number of block.	Area.	Red gum.		Black gum.		Black oak.		White oak.		All species.
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Total yield by blocks.
	Acres.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
I	870.4	426	370,790	116	100,966	235	204,544	189	164,506	3,492,914
II	137.2	1,055	144,746	23	3,156	1,195	163,954	393	53,920	752,269
Total	1,007.6	.....	515,536	.....	104,122	.....	368,498	.....	218,426	4,245,183

PETER MURPHY.

Number of block.	Area.	Loblolly pine.		Longleaf pine.		Cypress.		Yellow poplar.	
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.
	Acres.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
I	553.0	4,376	2,419,928	2,177	1,203,881	314	173,642	130	23,218
II	178.6	3,921	700,291	.....	.....	6,657	1,188,940	3	1,437
III	479.0	2,432	1,164,928	846	405,234	9	4,311	106	11,745
IV	110.8	10,225	1,132,930	1,362	150,910	762	84,430	.....	.....
Total	1,321.4	.....	5,418,077	.....	1,760,025	.....	1,451,323	.....	36,400

Number of block.	Area.	Red gum.		Black gum.		Black oak.		White oak.		All species.
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Total yield by blocks.
	Acres.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
I	553.0	186	102,858	158	87,374	130	71,890	24	13,272	4,072,845
II	178.6	934	166,812	229	40,899	240	42,864	27	4,822	2,167,846
III	479.0	34	16,286	106	50,774	25	11,975	5	2,395	1,657,340
IV	110.8	325	36,010	85	9,418	358	39,666	34	3,767	1,468,876
Total	1,321.4	.....	321,966	.....	188,465	.....	166,395	.....	24,256	9,366,907

SILKHOPE, EAST.

Number of block.	Area.	Loblolly pine.		Longleaf pine.		Cypress.		Yellow Poplar.	
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.
	Acres.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
I	1,677.8	1,838	3,083,796	2,155	3,615,659	7	11,745	3	5,033
II	341.4	1,796	613,154	985	336,279	225	76,815	1	341
III	84.6	745	63,027	131	11,083	.....	.....	.....	.....
Total	2,103.8	.....	3,759,977	.....	3,963,021	.....	88,560	.....	5,374

TABLE V.—*Yield from trees 10 inches and over in diameter breasthigh*—Continued.

SILKHOPE, EAST—Continued.

Number of block.	Area.	Red gum.		Black gum.		Black oak.		White oak.		All species.
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield	Total yield by blocks.
	Acres.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
I	1,677.8	111	186,236	49	82,212	73	122,479	47	78,857	7,186,017
II	341.4	1,248	426,067	19	6,487	123	41,992	153	52,234	1,553,369
III	84.6	1,948	164,801	48	4,061	311	26,311	886	74,956	344,239
Total	2,103.8	.....	777,104	.....	92,760	.....	190,782	.....	206,047	9,083,625

SILKHOPE, WEST.

Number of block.	Area.	Loblolly pine.		Longleaf pine.		Cypress.		Yellow poplar.	
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.
	Acres.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
I	637.2	6,296	4,011,811	873	556,276	.....	.....	.....	.....
II	25.0	191	4,775	.....	.....	.....	.....	.....	.....
Total	662.2	.....	4,016,586	.....	556,276	.....	.....	.....	.....

Number of block.	Area.	Red gum.		Black gum.		Black oak.		White oak.		All species.
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Total yield by blocks.
	Acres.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
I	637.2	331	210,913	42	26,762	91	57,985	49	31,223	4,894,970
II	25.0	.....	.....	.....	.....	.....	.....	.....	.....	4,775
Total	662.2	.....	210,913	.....	26,762	.....	57,985	.....	31,223	4,899,745

LIMERICK.

Number of block.	Area.	Loblolly pine.		Longleaf pine.		Cypress.		Yellow poplar.	
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.
	Acres.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
I	185.8	2,811	522,284	1,743	323,849	.....	.....	.....	.....
II	1,295.8	1,694	2,195,085	3,686	4,776,319	.....	.....	3	3,887
III	256.6	1,204	308,946	5,403	1,386,410	.....	.....	.....	.....
IV	999.4	1,574	1,573,057	823	822,507	94	93,943	.....	.....
Total	2,737.6	.....	4,599,372	.....	7,309,507	.....	93,943	.....	3,887

TABLE V.—*Yield from trees 10 inches and over in diameter breasthigh*—Continued.

LIMERICK—Continued.

Number of block.	Area.	Red gum.		Black gum.		Black oak.		White oak.		All species.
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Total yield by blocks.
	Acres.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
I	185.8	.....	.....	.....	.....	.....	.....	.....	.....	846,133
II	1,295.8	7	9,071	48	62,198	13	16,845	12	15,550	7,078,955
III	256.6	.....	.....	39	10,007	2	513	.....	.....	1,705,876
IV	999.4	370	369,778	89	88,947	208	207,875	271	270,837	3,426,943
Total	2,737.6	.....	378,849	.....	161,152	.....	225,233	.....	286,387	13,057,907

RODGERS.

Number of block.	Area.	Loblolly pine.		Longleaf pine.		Cypress.		Yellow poplar.	
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.
	Acres.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
I	489.4	1,855	907,837	1,259	616,155	312	152,693	.....	.....
II	97.4	2,953	287,622	.....	.....	6,828	665,047	178	17,337
Total	586.8	.....	1,195,459	.....	616,155	.....	817,740	.....	17,337

Number of block.	Area.	Red gum.		Black gum.		Black oak.		White oak.		All species.
		Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Average yield per acre.	Total yield.	Total yield by blocks.
	Acres.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd ft.*
I	489.4	59	28,875	34	16,640	46	22,512	53	25,938	1,770,650
II	97.4	217	21,136	2,604	253,630	1,085	105,679	664	64,674	1,415,125
Total	586.8	.....	50,011	.....	270,270	.....	128,191	.....	90,612	3,185,775

YIELD BETWEEN DIFFERENT DIAMETERS.

Table VI shows the yield of loblolly pine, longleaf pine, and cypress by blocks and by holdings between different diameters. Since, as a rule, the size of the tree is an indication of the quality of timber it will yield, it is thought that this table will give a better idea of the money value of the present yield than Table V, which shows the yield from all trees 10 inches and over diameter breasthigh.

TABLE VI.—*Yields from various holdings.*

TOTAL YIELD FROM HELL HOLE HOLDING.

Block No.	Cutting limit diameter breasthigh.	Loblolly pine.	Longleaf pine.	Both pines.	Bald cypress.	Yellow poplar.
	Inches.	*Board feet.*	*Board feet.*	*Board feet.*	*Board feet.*	*Board feet.*
I	10–14	2,275,736	2,418,385	4,694,121	291,931	46,444
	15–18	3,284,226	2,152,998	5,437,219		
	19–21	2,713,633	587,180	3,300,813	82,935	33,174
	22 and over	2,945,851	155,918	3,101,769		
	Total	11,219,446	5,314,476	16,533,922	374,866	79,618
II	10–14	1,243,375	106,446	1,349,821	2,049,644	242,334
	15–18	2,529,782	208,362	2,738,144		
	19–21	2,099,470	88,327	2,187,797	4,060,786	742,854
	22 and over	5,170,538	70,209	5,240,747		
	Total	11,043,165	473,344	.....	6,110,430	985,188
III	10–14	1,976,856	513,845	2,490,701	486,293	44,083
	15–18	2,905,358	779,722	3,685,080		
	19–21	2,594,021	373,330	2,967,351	951,922	278,275
	22 and over	2,869,541	192,864	3,062,405		
	Total	10,345,776	1,859,761	12,205,537	1,438,215	322,358
IV	10–14	1,352,622	21,661	1,374,203	5,015,771	113,120
	15–18	3,189,010	26,475	3,215,485		
	19–21	3,039,788	45,729	3,085,517	6,017,000	669,090
	22 and over	3,790,710	21,661	3,812,371		
	Total	11,372,130	115,526	11,487,656	11,032,771	782,210
V	10–14	1,452,837	193,091	1,645,928	1,168,434	8,142
	15–18	2,134,472	105,270	2,239,742		
	19–21	1,349,894	17,448	1,367,342	396,070	88,403
	22 and over	1,514,486	53,507	1,567,993		
	Total	6,451,689	369,316	6,821,005	1,564,504	96,545
VI	10–14	573,308	.....	573,308	60,889	20,541
	15–18	1,140,014	.....	1,140,014		
	19–21	1,303,607	.....	1,303,607	260,428	39,248
	22 and over	1,927,901	.....	1,927,901		
	Total	4,944,830	.....	4,944,830	321,317	59,789
VII	10–14	826,613	.....	826,613	365,040	.....
	15–18	1,286,158	.....	1,286,158		
	19–21	1,424,873	.....	1,424,873	107,890	.....
	22 and over	1,908,754	.....	1,908,754		
	Total	5,446,398	.....	5,446,398	472,930	.....
VIII	10–14	852,678	.....	852,678	3,787,023	.....
	15–18	1,732,547	.....	1,732,547		
	19–21	1,414,968	.....	1,414,968	1,659,678	.....
	22 and over	1,563,969	.....	1,563,969		
	Total	5,564,162	.....	5,564,162	5,446,701	.....
IX	10–14	1,672,778	1,752	1,674,530	3,406,862	5,255
	15–18	2,965,459	5,255	2,970,714		
	19–21	3,468,168	5,255	3,473,423	4,284,414	12,261
	22 and over	7,244,618	29,777	7,274,395		
	Total	15,351,023	42,039	15,393,062	7,691,276	17,516
X	10–14	1,477,476	.....	1,477,476	2,315,570	.....
	15–18	2,095,236	.....	2,095,236		
	19–21	1,642,212	.....	1,642,212	721,750	.....
	22 and over	2,254,824	.....	2,254,824		
	Total	7,469,748	.....	7,469,748	3,037,320	.....
XI	10–14	2,954,868	159,964	3,114,832	1,284,584	.....
	15–18	2,725,072	210,308	2,935,380		
	19–21	1,151,416	43,848	1,195,264	548,100	.....
	22 and over	1,435,616	.....	1,435,616		
	Total	8,266,972	414,120	8,681,092	1,832,684	.....

TABLE VI.—*Yields from various holdings*—Continued.

TOTAL YIELD FROM HELL HOLE HOLDING—Continued.

Block No.	Cutting limit diameter breasthigh.	Loblolly pine.	Longleaf pine.	Both pines.	Bald cypress.	Yellow poplar.
	Inches.	*Board feet.*	*Board feet.*	*Board feet.*	*Board feet.*	*Board feet.*
XII....	10-14	4,637,742	.....	4,637,742	1,445,988	.....
	15-18	1,669,352	.....	1,669,352		
	19-21	457,308	.....	457,308	496,103	.....
	22 and over	288,022	.....	288,022		
	Total	7,052,424	.....	7,052,424	1,942,091	.....
XIII...	10-14	536,373	.....	536,373	571,442	.....
	15-18	604,712	.....	604,712		
	19-21	401,043	.....	401,043	33,720	.....
	22 and over	187,034	.....	187,034		
	Total	1,729,162	.....	1,729,162	605,162	.....
XIV ..	10-14	142,595	156,380	298,975	78,836	.....
	15-18	364,457	238,232	602,689		
	19-21	308,453	146,903	455,356	67,636	.....
	22 and over	1,200,640	141,302	1,341,942		
	Total	2,016,145	682,817	2,698,962	146,472	.....

TOTAL YIELD FROM CHAPEL HILL HOLDING.

I.....	10-14	734,829	2,470,378	3,205,207	748,123	.....
	15-18	657,478	951,168	1,608,646		
	19-21	540,244	154,701	694,945	238,094	.....
	22 and over	644,184	37,467	681,651		
	Total	2,576,735	3,613,714	6,190,449	986,217	.....
II.....	10-14	631,620	8,712	640,332	1,612,591	871
	15-18	1,691,870	.....	1,691,870		
	19-21	2,056,903	.....	2,056,903	597,643	.....
	22 and over	3,388,097	.....	3,388,097		
	Total	7,768,490	8,712	7,777,202	2,210,234	871
III.....	10-14	268,814	35,162	303,976	162,180	.....
	15-18	284,612	17,963	302,575		
	19-21	444,244	.....	444,244	63,700	.....
	22 and over	356,593	20,002	376,595		
	Total	1,354,263	73,127	1,427,390	225,880	.....
IV.....	10-14	913,353	344,117	1,257,470	617,080	4,907
	15-18	1,716,293	321,422	2,037,715		
	19-21	1,526,139	99,984	1,626,123	203,649	.....
	22 and over	2,526,595	142,922	2,669,517		
	Total	6,682,380	908,445	7,590,825	820,729	4,907
V.....	10-14	274,981	.....	274,981	194,969	.....
	15-18	250,399	.....	250,399		
	19-21	201,476	.....	201,476	67,239	.....
	22 and over	601,536	.....	601,536		
	Total	1,328,392	.....	1,328,392	262,208	.....

TOTAL YIELD FROM LIMERICK HOLDING.

I.....	10-14	448,521	86,954	535,475	.....	.....
	15-18	69,489	151,613	221,102	.....	.....
	19-21	4,274	57,971	62,245	.....	.....
	22 and over	.....	27,313	27,313	.....	.....
	Total	522,284	323,851	846,135	.....	.....
II.....	10-14	1,026,274	1,850,403	2,876,677	.....	3,887
	15-18	693,253	1,578,284	2,271,537	.....	.....
	19-21	241,019	759,339	1,000,358	.....	.....
	22 and over	234,540	588,293	822,833	.....	.....
	Total	2,195,086	4,776,319	6,971,405	.....	3,887

TABLE VI.— *Yields from various holdings*—Continued.

TOTAL YIELD FROM LIMERICK HOLDING—Continued.

Block No.	Cutting limit diameter breasthigh.	Loblolly pine.	Longleaf pine.	Both pines.	Bald cypress.	Yellow poplar.
	Inches.	*Board feet.*	*Board feet.*	*Board feet.*	*Board feet.*	*Board feet.*
III.....	10–14	53,886	303,045	356,931	.....	.....
	15–18	97,765	426,726	524,491	.....	.....
	19–21	54,912	161,145	216,057	.....	.....
	22 and over	102,383	495,495	597,878	.....	.....
	Total	308,946	1,386,411	1,695,357	.....	.....
IV.....	10–14	477,713	361,783	839,496	17,988	.....
	15–18	455,726	323,806	779,532		
	19–21	298,821	109,934	408,755	75,954	.....
	22 and over	340,795	26,984	367,779		
	Total	1,573,055	822,507	2,395,562	93,942	.....
	TOTAL YIELD FROM RODGERS HOLDING.					
I.....	10–14	235,401	114,030	349,431	44,046	.....
	15–18	195,760	205,548	401,308		
	19–21	127,243	82,218	209,461	108,646	.....
	22 and over	349,432	214,357	563,789		
	Total	907,836	616,153	1,523,989	152,692	.....
II.....	10–14	19,285	.....	19,285	142,788	.....
	15–18	30,194	.....	30,194		
	19–21	97,790	.....	97,790	522,259	17,337
	22 and over	140,353	.....	140,353		
	Total	287,622	.....	287,622	665,047	17,337
	TOTAL YIELD FROM WINDSOR HOLDING.					
I.....	10–14	299,418	139,264	438,682	31,334	870
	15–18	396,032	138,394	534,426		
	19–21	346,419	61,798	408,217	.....	60,928
	22 and over	1,148,928	28,723	1,177,651		
	Total	2,190,797	368,179	2,558,976	31,334	61,798
II.....	10–14	115,797	.....	115,797	76,695	.....
	15–18	73,539	.....	73,539		
	19–21	14,418	.....	14,818	67,091	.....
	22 and over	38,553	.....	38,553		
	Total	242,707	.....	242,707	143,786	.....
	TOTAL YIELD FROM PETER MURPHY HOLDING.					
I.....	10–14	405,349	633,738	1,039,087	55,853	.....
	15–18	691,803	407,008	1,098,811		
	19–21	496,041	100,093	596,134	117,789	.....
	22 and over	826,735	63,042	889,777		
	Total	2,419,928	1,203,881	3,623,809	173,642	.....
II.....	10–14	58,581	.....	58,581	600,453	16,253
	15–18	115,554	.....	115,554		
	19–21	170,384	.....	170,384	588,487	6,965
	22 and over	355,771	.....	355,771		
	Total	700,290	.....	700,290	1,188,940	23,218
III.....	10–14	390,385	164,776	555,161	4,311	1,437
	15–18	311,350	145,616	456,966		
	19–21	224,172	77,598	301,770	.....	.....
	22 and over	239,021	17,244	256,265	.....	.....
	Total	1,164,928	405,234	1,570,162	4,311	1,437
IV.....	10–14	130,522	17,396	147,918	35,788	7,202
	15–18	271,903	32,132	304,035		
	19–21	326,971	18,947	345,918	48,641	4,543
	22 and over	403,534	82,435	485,969		
	Total	1,132,930	150,910	1,283,840	84,429	11,745

TABLE VI.—*Yields from various holdings*—Continued.

TOTAL YIELD FROM BATES HOLDING.

Block No.	Cutting limit diameter breasthigh.	Loblolly pine.	Longleaf pine.	Both pines.	Bald cypress.	Yellow poplar.
	Inches.	*Board feet.*	*Board feet.*	*Board feet.*	*Board feet.*	*Board feet.*
I	10–14	3,127,236	4,123,392	7,250,628	2,061,696	2,478
	15–18	3,521,238	2,502,780	6,024,018		
	19–21	2,758,014	386,568	3,144,582	659,148	
	22 and over	4,294,374	128,856	4,423,230		
	Total	13,700,862	7,141,596	20,842,458	2,720,844	2,478
II	10–14	140,182	16,232	156,414	644,099	59,762
	15–18	510,558	5,902	516,460		
	19–21	803,464		803,464	1,392,966	244,212
	22 and over	1,911,640		1,911,640		
	Total	3,365,844	22,134	3,387,978	2,037,065	303,974

TOTAL YIELD FROM RIVERS HOLDING.

I	10–14	479,767	1,536,794	2,016,561	253,139	
	15–18	572,984	981,770	1,554,754		
	19–21	397,668	260,836	658,504	71,837	
	22 and over	541,342	61,574	602,916		
	Total	1,991,761	2,840,974	4,832,735	324,976	
II	10–14	107,862	105,843	213,705	198,852	
	15–18	269,077	80,608	349,685		
	19–21	214,858	24,370	239,228	19,323	
	22 and over	445,145	11,680	456,825		
	Total	1,036,942	222,501	1,259,443	218,175	

TOTAL YIELD FROM McCABE & INABINETT HOLDING.

I	10–14	2,071,440	1,085,040	3,156,480	1,219,190	
	15–18	2,175,998	686,534	2,862,532		
	19–21	1,499,328	218,981	1,718,309	595,786	
	22 and over	2,852,669	218,981	3,071,650		
	Total	8,599,435	2,209,536	10,808,971	1,814,976	
II	10–14	87,547	30,857	118,404	196,622	12,199
	15–18	232,263	4,545	236,808		
	19–21	378,414		378,414	499,928	86,830
	22 and over	966,607		966,607		
	Total	1,664,831	35,402	1,700,233	696,550	99,029
III	10–14	1,248,990	516,671	1,765,661	190,985	
	15–18	1,221,164	412,957	1,634,121		
	19–21	861,329	144,187	1,005,516	321,892	
	22 and over	241,644	153,041	1,094,685		
	Total	4,273,127	1,226,856	5,499,983	512,877	

TOTAL YIELD FROM HILL HOLDING.

I	10–14	1,087,649	1,257,329	2,344,978	257,914	
	15–18	882,336	868,762	1,751,098		
	19–21	592,183	412,322	1,004,505	218,887	
	22 and over	1,415,131	200,222	1,615,353		
	Total	3,977,299	2,738,635	6,715,934	476,801	
II	10–14	124,852		124,852	105,360	
	15–18	155,757	17,736	173,493		
	19–21	223,012	11,940	234,952		
	22 and over	787,742	6,848	794,590		
	Total	1,291,363	36,524	1,327,887	105,360	
III	10–14	35,670		35,670	11,932	
	15–18	49,486	4,898	54,384		
	19–21	13,439		13,439	32,907	
	22 and over	100,229		100,229		
	Total	198,824	4,898	203,722	44,839	

TABLE VI.—*Yields from various holdings*—Continued.

TOTAL YIELD FROM FISHBROOK HOLDING.

Block No.	Cutting limit diameter breasthigh.	Loblolly pine.	Longleaf pine.	Both pines.	Bald cypress.	Yellow poplar.
	Inches.	*Board feet.*	*Board feet.*	*Board feet.*	*Board feet.*	*Board feet.*
I	10–14	347,609	425,482	773,091	5,643	1,129
	15–18	644,431	165,904	810,335		
	19–21	523,670	54,173	577,843	6,772	
	22 and over	1,174,873	25,958	1,200,831		
	Total	2,690,583	671,517	3,362,100	12,415	1,129
II	10–14	52,937		52,937	227,283	3,452
	15–18	189,307		189,307		
	19–21	314,744		314,744	209,446	24,167
	22 and over	1,157,705		1,157,705		
	Total	1,714,693		1,714,693	436,729	27,619

TOTAL YIELD FROM SILKHOPE, EAST, HOLDING.

I	10–14	555,352	1,684,511	2,239,863		5,033
	15–18	744,943	1,494,920	2,239,863		
	19–21	587,230	286,904	874,134	11,745	
	22 and over	1,196,271	149,324	1,345,595		
	Total	3,083,796	3,615,659	6,699,455	11,745	5,033
II	10–14	108,907	164,213	273,120	71,353	341
	15–18	44,723	124,952	169,675		
	19–21	130,415	38,920	169,335	5,462	
	22 and over	329,110	8,194	337,304		
	Total	613,155	336,279	949,434	76,815	341
III	10–14	21,235	1,184	22,419		
	15–18	2,284	6,176	8,460		
	19–21	9,052	3,722	12,774		
	22 and over	30,456		30,456		
	Total	63,027	11,082	74,109		

TOTAL YIELD FROM SILKHOPE, WEST, HOLDING.

I	10–14	763,366	153,565	916,931		
	15–18	1,078,142	285,466	1,363,608		
	19–21	649,307	73,915	723,222		
	22 and over	1,520,996	43,330	1,564,326		
	Total	4,011,811	556,276	4,568,087		
II	10–14					
	15–18					
	19–21	4,775		4,775		
	22 and over					
	Total	4,775		4,775		

TOTAL YIELD FOR TRACT BY SPECIES.

Table VII shows the total number of board feet of lumber over the whole tract by species. This table includes all trees 10 inches and over in diameter breasthigh. It is seen that the stand of loblolly pine exceeds that of all the other species combined.

TABLE VII.—*Total yield for tract of trees 10 inches and over in diameter breasthigh.*

Species.	Yield.	Log rule.	Species.	Yield.	Log rule.
	Board feet.			*Board feet.*	
Loblolly pine	193,911,867	Two-thirds.	Black gum	26,755,818	Doyle.
Longleaf pine	45,598,711	Do.	Black oak	5,452,440	Do.
Cypress	58,550,299	Do.	White oak	2,020,881	Do.
Yellow poplar	2,908,027	Doyle.			
Red gum	7,640,485	Do.	Total	342,838,528	

NUMBER OF TREES OF EACH DIAMETER OF ASH, MAPLE, AND HICKORY ON THE WHOLE TRACT.

Table VIII shows the number of ash, maple, and hickory trees 10 inches and over in diameter breasthigh over the whole tract. This table is given to show, in a general way, the amount of timber available from these species, lack of volume tables making it impossible to give their volume in board feet.

TABLE VIII.—*Stand of ash, maple, and hickory over the whole tract.*

Diameter breasthigh.	Total number of trees on the tract.			Diameter breasthigh.	Total number of trees on the tract.		
	Ash.	Maple.	Hickory.		Ash.	Maple.	Hickory.
Inches.				*Inches.*			
10	3,029	18,282	1,199	21	262	1,445	266
11	2,636	9,480	802	22	135	1,048	266
12	1,842	12,363	933	23	131	659	.....
13	1,711	8,027	667	24	.....	528	.....
14	1,588	7,229	532	25	.....	393	131
15	1,183	6,177	528	26	.....	131	.....
16	794	5,522	266	27	.....	131	.....
17	528	4,728	266	28	.....	131	.....
18	528	3,815	135	30	.....	131	.....
19	528	2,497	266				
20	262	2,231	.....	Total	15,157	84,948	6,257

COMPARISON OF TWO-THIRDS AND DOYLE RULES.

Table IX shows the total yield for each holding from the three most important species—loblolly pine, longleaf pine, and cypress—scaled both by the two-thirds and by the Doyle log rules. In each case the scale by the two-thirds rule is far in excess of that by the Doyle rule.

TABLE IX.—*Comparison of total yield from holdings by two-thirds and Doyle rules.*

Name of holding.	Loblolly pine.		Longleaf pine.		Cypress.		Excess by Two-thirds rule.
	Two-thirds rule.	Doyle rule.	Two-thirds rule.	Doyle rule.	Two-thirds rule.	Doyle rule.	
	Bd. ft.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
Hell Hole	108,273,069	87,784,270	9,271,396	6,227,870	42,016,738	32,293,301	33,255,762
Chapel Hill	19,710,259	16,524,720	4,603,999	2,721,189	4,505,269	3,004,187	6,569,431
Bates	17,066,706	14,177,384	7,163,730	4,270,484	4,757,910	3,593,342	6,947,136
Rivers	3,028,703	2,466,156	3,063,475	1,869,551	543,151	342,924	1,956,698
McCabe & Inabinett	14,587,394	11,673,604	3,471,794	2,235,991	3,024,402	2,360,200	4,763,795
Hill	5,467,486	4,558,413	2,780,048	1,820,777	627,000	452,152	2,043,192
Fishbrook	4,405,274	3,729,679	671,517	399,524	449,144	346,766	1,049,966
Windsor	2,433,504	2,123,614	368,179	253,286	175,120	122,687	477,216
Peter Murphy	5,418,077	4,445,166	1,760,025	1,137,241	1,451,323	1,192,418	1,854,600
Silkhope, East	3,759,977	3,145,451	3,963,021	2,708,708	88,560	68,387	1,889,012
Silkhope, West	4,016,586	3,354,484	556,276	394,427	.....	.....	823,951
Limerick	4,599,372	3,258,258	7,309,085	5,102,772	93,943	87,947	3,553,423
Rodgers	1,195,460	993,555	616,156	487,932	817,739	773,950	373,918
Total	193,911,867	158,234,754	45,598,711	29,629,752	58,550,299	44,638,261	65,558,110

LUMBERING.

When lumbering operations began under the present owners, the only lands on which lumbering had been done were those bearing a considerable stand of longleaf pine. These lands were cut over from ten to fifteen years ago, when, owing to the low stumpage prices and the high cost of transporting logs, only the sound and largest trees were removed. As a consequence a good stand of thrifty young trees remains on some of the longleaf pine lands. The bulk of these old cut-over lands, however, have, as a result of this first lumbering and the fires that followed it, a very open stand of longleaf. Since the present owners have commenced operations on the tract cutting has been mainly confined to the loblolly pine lands, which were in virgin forest. These lands are now being cut over at the rate of about 20,000,000 board feet per year to supply the company's mill, and it is the intention of the owners to continue cutting at this rate until the lands are all logged over.

Under present methods lumbering is very close and there is little waste. Practically all pine down to 12 inches in diameter breasthigh is removed, and trees smaller than this are often taken. With the exception of yellow poplar, no hardwoods are cut. Since nearly all lands support at least a sparse growth of hardwoods, cut-over areas have a very open growth of hardwoods, with pine scattered through them.

Lumbering is now done almost entirely by railroad and steam skidders. Spurs are run out from the main tramway at intervals of about one-fourth of a mile, and skidders snake the logs from the stump to the track and load them on the cars. Timber carts are sometimes used when logs from a small area of timber, out of reach of a spur, can be more economically got out thus than by building new track.

Owing to the flatness of the country, very little grading has to be

done when putting down track, but much trouble is caused by the large number of marshy places, where the track sinks. The rails and ties used in building the spurs are taken up as soon as the timber is removed and laid over again elsewhere. The frequent spiking soon renders the ties useless, but the rails last for many years. Young timber is used to a large extent for the ties, track corduroy, and firewood.

Table X shows the number of trees of each species left per acre after cutting on a part of Fishbrook holding. For this table hardwoods were measured to 10 inches and softwoods to 2 inches in diameter breasthigh. Of the 36.78 loblolly pine trees left on each acre, 12.5 are over 5 inches in diameter and 3.36 are over 10 inches in diameter. Since nearly every loblolly pine tree left standing should be large enough to cut at the next rotation, the basis for a good second cut is already on the ground.

TABLE X.—*Stand per acre of softwoods 2 inches and over, and of hardwoods 10 inches and over in diameter breasthigh, left after lumbering on Fishbrook.*

Species.	Number of trees.	Per cent.	Species.	Number of trees.	Per cent.
Loblolly pine	36.78	67.70	Hickories	0.59	1.09
Red gum	8.52	15.68	Longleaf pine	.25	.46
Black oaks	1.91	3.51	Cypress	.19	.35
White oaks	1.46	2.69	Elms	.14	.26
Shortleaf pine	.83	1.53	Ashes	.12	.22
Black gum	.83	1.53	Yellow poplar	.06	.11
Red maple	.68	1.25	Spruce pine	.03	.06
Dead pines	.67	1.23			
Cedar	.67	1.23	Total	54.33	100.00
Beech	.60	1.10			

MARKET AND TRANSPORTATION.

An excellent system for the transportation of logs from the woods to the mill is now in operation. Logs are carried to the landing on Cooper River by rail, at which point they are bundled or made into rafts and towed down the river to the mill, 40 miles below. This system of transportation is effective and cheap. The cost of transporting logs from the stump to the mill for the year 1902 was $2.79 per 1,000 board feet. In any system of water transportation a great many logs sink, and are either lost entirely or recovered at heavy cost. A deceased manager of the company devised a scheme whereby such loss in Cooper River is largely eliminated. A trestle is built out into the river and the carloads of logs run out upon it. Two chains are then fastened to the trestle below the cars, passed down into the water, and again attached to a windlass on a framework above the trestle. As the logs are thrown into the water they are caught in the loops of the chain, and when a sufficient number to make up a bundle has been thrown off the cars the chains are tightened and the logs bound together. By this means the lighter logs float the heavier, and no

loss occurs unless the logs loosen in the bundle and slip out. This seldom happens.

The mill is situated in a seaport town, so that facilities are excellent for export trade, and a large amount of the best grades of timber is exported to England, Scotland, Germany, and Holland. The bulk of the timber manufactured is still, however, sold in this country. The market for loblolly pine, the chief timber tree on the tract, is a constantly increasing one, and though the longleaf pine lumber brings better prices, the more rapid growth of the former species makes it the more profitable one to grow in the future.

FIRE.

Adequate protection from fire is essential to the conservative management of the timberlands of the E. P. Burton Lumber Company.

Fire has passed over nearly every acre of land owned by the company, and fires will continue to be common unless drastic measures are taken to prevent them. Ever since the settlement of this country it has been customary to burn over the pine lands in early spring, to improve pasturage and prevent the growth of underbrush. This custom is now acknowledged by many of the inhabitants to be shortsighted, but there is still a lack of active opposition to the practice, and fires continue to be set by negroes and people not interested in lumbering or agriculture. The tall growth of grass under the open stands of pine makes the starting of fires very easy; many are consequently accidental in origin.

EFFECT ON THE SOIL.

In consequence of these repeated fires, humus and leaf litter are largely wanting on the uplands. Swamps and bottoms have been harmed little, for they are seldom dry enough to burn, but even here fires have occurred in the past, and only a dry season is necessary for them to occur again.

EFFECT ON STANDING TREES.

The surface or grass fires do not kill the large trees, but by burning up all of the leaves, needles, and twigs on the ground they rob the soil of its natural fertilizer. What effect this has on the development of trees which are not killed can only be conjectured, but it certainly lessens their rapidity of growth.

Many standing trees are killed each year by fires. Owing to the thick bark of both loblolly and longleaf pine, these trees resist fire to a remarkable degree, and a tree not previously injured seldom succumbs to a grass fire. Slash fires, however, are sometimes so intense that they kill trees outright, particularly small ones. Hardwoods are

not easily killed by grass fires after they reach a diameter of 6 or 8 inches, though they are much more susceptible than pines.

The boxing for turpentine of both longleaf and loblolly pine has done much to make fire disastrous to standing timber. The wood in these boxes is fatty, or full of pitch, and fire catches easily and burns intensely in it. Trees that have been boxed are often killed outright or so badly burned that they are thrown by the first heavy wind. Trees injured by fire, whether previously boxed or not, are often attacked by fungi, which weaken them and make them liable to windfall.

Fire affects the merchantable condition of trees, both by causing pitch to accumulate about fire scars, thus making the butts of the trees fatty, and by making trees susceptible to attack by fungi. In either case the part affected becomes worthless for lumber.

EFFECT ON REPRODUCTION.

The resistance of the mature trees to fire is not shared by the seedlings. Seedlings start in the grass, and if fire occurs before they have grown above it a large percentage of them are killed. Longleaf pine seedlings are practically safe from light fires after a height of 1 foot is reached, but loblolly seedlings 3 or 4 feet high often succumb to them. This means, in the case of loblolly pine, that seedlings are not safe until they reach an age of from 3 to 5 years.

GRAZING.

Cattle, sheep, and hogs are ranged on all parts of the company's holdings by people living on or near the tract. Although this section of the country is not well suited to grazing, and cattle here do very poorly, cattle-raising is one of the chief sources of income to the resident farmers.

The number of cattle ranged on the company's holdings is not large and the direct damage done by grazing is small. The chief damage from this source is through its relation to forest fires, most of which are set to improve the range. In the winter the grass becomes very dry, which makes the green grass coming up under it in the spring very hard for cattle to get at. If the land is burned over early in the spring, however, cattle can get at the new grass without difficulty. This practice of burning is, nevertheless, shortsighted. The soil is impoverished by it, and the better but less hardy grasses are killed out. The poorer grasses already form so large a part of what now grows on the pine lands that even with protection from fire a long time would elapse before the grazing would be materially improved.

The chief direct damage done by animals is the rooting up of loblolly and longleaf pine seedlings by hogs. Large numbers of seedlings are thus destroyed. But it is certain that the greatest damage done the forest at present is by fire, and, if this be eliminated, grazing can go on without causing noticeable harm.

FIG. 1.—VIRGIN LONGLEAF PINE, HILL COUNTRY.

FIG. 2.—STAND OF MEDIUM LOBLOLLY ON AN OLD FIELD.

SILVICAL DESCRIPTION OF THE MOST IMPORTANT TREES.

LOBLOLLY PINE.

LOCAL DISTRIBUTION AND OCCURRENCE.

Loblolly pine occurs throughout the tract from the wet swamps to the dry sandy uplands. It prefers, however, the intermediate flat moist lands, edges of swamps, and well-drained bottoms. It occurs both in pure stands and in mixture with other species, developing well in either case.

ASSOCIATED SPECIES.

In the swamps themselves loblolly pine is seldom the dominant species, but is scattered throughout the forest of gums, cypress, oaks, maple, and ash. On the low islands in the swamps, along the edges of swamps, and on the large areas of moist flat land characteristic of the tract loblolly pine occurs practically in pure stands. Such hardwoods as red gum, black gum, and stunted oaks, together with cypress and occasional pond pines, are generally present in the form of an understory, but are not important. As the moisture decreases longleaf pine comes into the mixture, and when the soil becomes dry forms the main stand with loblolly as a secondary species.

DEMANDS UPON SOIL AND MOISTURE.

Loblolly pine is in no way fastidious in its soil requirements. With a good amount of moisture, it holds its place tenaciously on any class of soil. When, however, the soil becomes dry, it is easily ousted by the longleaf. In the wet swamps, while it sometimes occurs in large numbers, it is generally kept back by the black gum and other hardwoods. The trees in such places are uniformly large, but probably grow more slowly than when on only fairly moist soils. That moisture rather than quality of soil is the requisite for good growth is frequently illustrated by fringes of loblolly pine about the small pocosons in the midst of longleaf land.

FORM AND DEVELOPMENT.

The loblolly pine attains good size in all situations. Trees up to 30 inches in diameter are common, but trees over 40 inches in diameter are seldom seen. The largest tree measured was 42 inches in diameter. A height of 120 feet is often attained, and trees as high as 140 feet were measured. If grown in somewhat crowded stands, it has a long, straight, cylindrical bole, clear of limbs for 50 or 60 feet. In youth it has a long, broad, conical or ovoid crown, which as age increases dies off at the bottom and becomes smaller and more flattened.

TOLERANCE AND REPRODUCTION.

For a few years in early life loblolly will endure considerable shade, but for the best development full enjoyment of light from the start

is required. The shade of tall grass interferes with germination but does not prevent it.

Loblolly pine reproduces well, provided that sufficient moisture is present and that fire is kept out. Trees begin to bear seed at an early age, especially where there is an abundance of light, but large crops are not borne until a diameter of 10 inches is reached. After this period some seed is borne nearly every year, with heavy crops at intervals of two or three years. Seed is carried a long distance by the wind, so that a few good trees will seed up a large area. Exposed mineral soil makes the best germinating bed. For this reason the plowing up of the soil in skidding logs by steam is an advantage. Seedlings tend to come up in even-aged, dense stands. Old fields are seeded up progressively from the edges, while in virgin woods thickets come up adjacent to the dense stands where the light is good.

Natural thinning out progresses rapidly after the tenth or fifteenth year, the overtopped trees giving way and allowing the crowns of the dominant ones more room. Height and diameter growth are rapid at this period. Owing to repeated fires the filling up of blanks on the drier lands is exceptional, but along the edges of swamps thickets of poles are generally present.

On the cut-over lands reproduction, with few exceptions, has been excellent. This has been, however, the result of chance, no attempt having been made to leave seed trees. Since the future value of these timberlands depends on the reproduction of desirable species, seed trees must be carefully selected and left standing and fire must be entirely kept out if good results are to be insured.

RELATION OF AGE TO DIAMETER.

Table XI shows the average diameter breasthigh which a tree will reach in a given number of years. The fastest growth is made from the ninth to the twenty-seventh year, when it drops off slightly, and thereafter a uniform rate of growth is maintained until the forty-sixth year. Up to the eighty-third year growth is fair, but from then on it becomes slow.

TABLE XI.—*Age of loblolly pine.*

Diameter breast-high.	Age.	Diameter breast-high.	Age.	Diameter breast-high.	Age.	Diameter breast-high.	Age.
Inches.	*Years.*	*Inches.*	*Years.*	*Inches.*	*Years.*	*Inches.*	*Years.*
1	9	10	30	19	65	28	126
2	11	11	33	20	71	29	134
3	13	12	36	21	77	30	143
4	15	13	39	22	83	31	152
5	18	14	43	23	90	32	163
6	20	15	46	24	97	33	174
7	22	16	50	25	104	34	186
8	25	17	55	26	111	35	199
9	27	18	60	27	118	36	213

RELATION OF VOLUME TO AGE.

Table XII shows the number of board feet in a single tree at a given age. The greatest growth in volume is made up to the seventieth year. The rate then declines quite slowly and regularly to the one hundred and tenth year, after which it becomes irregular and drops off faster, but makes good growth up to the one hundred and seventieth year, and fair growth to the two hundred and fiftieth year.

TABLE XII.—*Volume of loblolly pine at various periods.*

Age.	Volume.	Age.	Volume.	Age.	Volume.
Years.	*Board feet.*	*Years.*	*Board feet.*	*Years.*	*Board feet.*
30	65	110	690	190	1,200
40	140	120	760	200	1,255
50	230	130	830	210	1,310
60	315	140	900	220	1,365
70	400	150	965	230	1,415
80	475	160	1,025	240	1,465
90	550	170	1,085	250	1,515
100	620	180	1,145		

RELATION OF AGE TO HEIGHT.

Height growth decreases rapidly from the tenth to the seventieth year, after which it is regular but slow to the one hundred and fortieth year. After the one hundred and fortieth year height growth becomes too slow to be of any importance as a volume factor.

TABLE XIII.—*Height of loblolly pine at various periods.*

Age.	Height.	Age.	Height.	Age.	Height.
Years.	*Feet.*	*Years.*	*Feet.*	*Years.*	*Feet.*
10	12	100	111	190	125
20	38	110	114	200	125
30	59	120	117	210	126
40	75	130	119	220	126
50	86	140	121	230	126
60	94	150	122	240	127
70	100	160	123	250	127
80	104	170	124		
90	108	180	124		

RELATION OF CLEAR LENGTH AND TOTAL HEIGHT TO DIAMETER BREASTHIGH.

The clear length (or the distance from the ground to where the first green limbs occur) at first increases much more slowly with growth in diameter than does the height of the tree. The clear length begins to increase most rapidly at the point where the growth in height begins to drop off slightly, or at about 8 inches in diameter. This rapid rate of increase in clear length continues until the tree is about 13 inches in diameter, after which it falls off rapidly, as does the height, which has been increasing at a uniform rate of a little over 5 feet to each inch of diameter growth. The growth in clear length becomes practically stationary when the tree is 20 inches in diameter.

TABLE XIV.—*Clear length and total height of loblolly pine.*

Diameter breast-high.	Clear length.	Height.	Diameter breast-high.	Clear length.	Height.	Diameter breast-high.	Clear length.	Height.
Inches.	*Feet.*	*Feet.*	*Inches.*	*Feet.*	*Feet.*	*Inches.*	*Feet.*	*Feet.*
1	.....	10	11	33	65	21	58	103
2	13	15	12	38	70	22	58	105
3	15	21	13	43	75	23	58	108
4	16	27	14	47	79	24	59	110
5	17	32	15	50	84	25	59	112
6	19	38	16	52	87	26	60	114
7	20	43	17	54	91	27	60	116
8	22	49	18	55	94	28	60	118
9	25	54	19	56	97	29	61	120
10	28	59	20	57	100	30	61	121

PERIODIC DIAMETER AND VOLUME INCREMENT.

Table XV shows the growth in diameter breasthigh and in volume at different periods in the life of a tree, and the number of years required to grow 1 inch in diameter.

TABLE XV.—*Rate of growth of loblolly pine.*

Period.	Periodic diameter breasthigh growth.	Periodic olume growth.	Time required to grow 1 inch in diameter breasthigh during period.	Age.	Time required to grow 1 inch in diameter breasthigh—average for total age of tree.
Years.	*Inches.*	*Board feet.*	*Years.*	*Years.*	*Years.*
20–30	3.9	.....	3	20	3
30–40	3.3	74	3	30	3
40–50	2.6	83	4	40	3
50–60	2.2	93		50	3
60–70	1.8	82	6	60	3
70–80	1.6	.....		70	4
				80	4

LONGLEAF PINE.

LOCAL DISTRIBUTION AND OCCURRENCE.

Longleaf pine is much more restricted in its occurrence than is loblolly. It is purely a tree of the higher, lighter, better-drained areas, and is rarely found where much moisture is present for any length of time. It occurs both in pure stands and in mixture, and thrives in either case.

ASSOCIATED SPECIES.

Over large areas longleaf pine occurs in nearly pure stands, though a scattering of single loblolly trees is nearly always present. As the soil moisture increases loblolly becomes more plentiful, until it is the dominant species.

As on loblolly pine land, there is nearly always a lower story of hardwoods. Where the soil is very dry oak sprouts sometimes get possession of small areas to the exclusion of pine.

DEMANDS UPON SOIL AND MOISTURE.

For the best development of longleaf pine a light, dry loam or sand is required. Over considerable areas, however, it develops well on a clay loam. With it, as with loblolly, moisture is of more importance in determining its distribution than soil qualities, longleaf pine withstanding very little moisture.

FORM AND DEVELOPMENT.

Owing to the removal of the large longleaf pines the average size of the trees is not great. The largest tree seen measured 40 inches in diameter, and trees over 2 feet in diameter are not common. In height, also, it is inferior to loblolly, seldom exceeding 100 feet.

Under favorable conditions longleaf pine develops a long, straight, cylindrical, clear bole 60 feet in length, with a small, flat crown. In youth it has a thin crown, with the branches turning up at the end, giving a candelabra-like effect. In the sapling stage trees have a remarkable height for their diameter and depend much on one another for support.

TOLERANCE AND REPRODUCTION.

Longleaf pine is the most intolerant species on the tract. From the start it endures little or no shade. Reproduction is found only in very open stands, where there is an abundance of sunlight. In the sapling thickets overtopped trees die out very fast, the first stage of their decline being the dying off of the leader.

If there is plenty of light, trees begin to bear seed when very small. Seed years occur less frequently than with loblolly, generally at intervals of three or four years. Seed is carried well by the wind, and a few trees will seed up considerable areas.

A mineral soil is most favorable for the germination of longleaf pine seed, but is seldom found except after lumbering. A heavy crop of grass nearly always covers the ground, and seeds germinate fairly well in this.

As a result of fires, the present tendency is for the trees to come up in even-aged groups. A small patch of ground is free from fire for a few years, and a group of trees springs up on it. If fire be kept out after cutting, the stand will come up as even-aged forest, provided sufficient seed trees be left.

Loblolly pine is not encroaching upon the longleaf land to any marked extent. Very few cases of loblolly following longleaf were seen.

RELATION OF AGE TO DIAMETER.

The diameter which a longleaf pine will reach in a given number of years is shown in Table XVI. Diameter growth is very uniform.

Up to about 90 years of age a little over five years is required to grow 1 inch in diameter. Beyond that point the rate of growth becomes very slow.

A comparison of this table with the one for loblolly pine will show that the diameter growth of longleaf for the first seventy years is only about one-half as fast as loblolly. At 100 years old, however, it has reached a diameter three-fifths that of loblolly of the same age, and during its second century of life it almost keeps pace with the loblolly.

TABLE XVI.—*Age of longleaf pine.*

Diameter breast-high.	Age.	Diameter breast-high.	Age.	Diameter breast-high.	Age.	Diameter breast-high.	Age.
Inches.	*Years.*	*Inches.*	*Years.*	*Inches.*	*Years.*	*Inches.*	*Years.*
1	19	9	62	17	114	25	220
2	24	10	67	18	125	26	235
3	30	11	72	19	137	27	251
4	35	12	78	20	150	28	267
5	40	13	83	21	164	29	283
6	46	14	89	22	177	30	299
7	52	15	96	23	191		
8	57	16	105	24	206		

RELATION OF VOLUME TO AGE.

(See Table XVII.)

In the case of longleaf pine sixty years must elapse before the merchantable contents of a tree become great enough to be considered. From this point the annual increment in volume continues to increase in amount to about the one hundredth year, between which and the one hundred and thirtieth year it makes a marked drop. Thenceforward it remains fairly uniform, though fluctuating somewhat one way or the other.

TABLE XVII.—*Volume of longleaf pine at various periods.*

Age.	Volume.	Age.	Volume.	Age.	Volume.
Years.	*Board feet.*	*Years.*	*Board feet.*	*Years.*	*Board feet.*
60	30	130	295	200	500
70	70	140	325	210	525
80	110	150	355	220	555
90	150	160	385	230	580
100	190	170	415	240	610
110	225	180	445	250	635
120	260	190	470		

RELATION OF AGE TO HEIGHT.

(See Table XVIII.)

Height growth of longleaf pine is greatest from the tenth to the thirtieth year, but continues to be rapid to the eightieth year. After this it rapidly drops, until at 120 years the tree is growing only one-tenth of a foot per year. It continues at about this rate up to two hundred years, after which it practically stops.

TABLE XVIII.—*Height of longleaf pine at various periods.*

Age.	Height.	Age.	Height.	Age.	Height.
Years.	*Feet.*	*Years.*	*Feet.*	*Years.*	*Feet.*
10	4	100	86	190	99
20	17	110	89	200	100
30	29	120	91	210	101
40	41	130	93	220	101
50	52	140	94	230	102
60	62	150	95	240	103
70	71	160	96	250	103
80	78	170	97		
90	83	180	98		

RELATION OF CLEAR LENGTH AND TOTAL HEIGHT TO DIAMETER BREASTHIGH.

(See Table XIX.)

Clear length and height both increase most rapidly before the trees are 10 inches in diameter. Height growth is uniformly greater than increase in clear length, but both continue at a uniform rate after the diameter reaches 10 inches, until it passes 20 inches, when both become exceedingly slow.

TABLE XIX.—*Clear length and total height of longleaf pine.*

Diameter breast-high.	Clear length.	Height.	Diameter breast-high.	Clear length.	Height.	Diameter breast-high.	Clear length.	Height.
Inches.	*Feet.*	*Feet.*	*Inches.*	*Feet.*	*Feet.*	*Inches.*	*Feet.*	*Feet.*
1	.....	14	9	38	64	17	56	89
2	15	23	10	41	69	18	57	91
3	19	30	11	44	73	19	59	93
4	23	36	12	46	77	20	60	95
5	26	42	13	49	80	21	61	96
6	29	48	14	51	82	22	62	98
7	32	53	15	53	85	23	62	99
8	35	59	16	54	87	24	63	100

PERIODIC DIAMETER AND VOLUME INCREMENT.

(See Table XX.)

The rate of diameter and volume growth is here shown for different periods in the life of a longleaf pine tree, and also the average number of years required for trees of different ages to grow 1 inch. The best periodic growth, both in diameter and volume, is made from the twentieth to the ninetieth years, the former culminating between the seventieth and eightieth years, and the latter between the eightieth and ninetieth years. In the case of the diameter growth for the total age of trees, it is seen that the best growth is between the eightieth and one hundredth years, while here the number of years required to grow 1 inch in diameter is much greater from the twentieth to the sixtieth years than for the same periods as shown under periodic diameter growth. This is due in the former case to the slow growth of longleaf pine during very early life, it taking, as shown in Table XIV, nineteen years to produce a tree 1 inch in diameter breasthigh.

TABLE XX.—*Rate of growth of longleaf pine.*

Periods.	Periodic diameter growth.	Periodic volume growth.	Time required to grow 1 inch in diameter breasthigh during period.	Age.	Time required to grow 1 inch in diameter breasthigh—average for total age of tree.
Years.	*Inches.*	*Bd. ft.*	*Years.*	*Years.*	*Years.*
20- 30	1.8	.....	6	20	17
30- 40	1.9	.....	5	30	10
40- 50	1.8	.....	5	40	8
50- 60	1.9	33		60	7
60- 70	1.9	35	5	80	6
70- 80	1.9	42		100	6
80- 90	1.7	42	6	120	7
90-100	1.4	40			
100-110	1.1	36	10		
110-120	1.0	36			

SHORTLEAF PINE.

Shortleaf pine is of too rare occurrence to be a factor in the commercial forest. With the exception of spruce pine, it is the pine least represented on the tract. It occurs for the most part as scattered individuals over restricted areas, occasionally forming 12 to 20 per cent of the stands. It is found in mixture with either longleaf or loblolly pine, but more frequently with the latter.

Its soil and moisture requirements are between those of the two pines with which it associates; it grows on the more moist longleaf lands and drier loblolly lands, preferring a fresh loam.

It is a uniformly small tree, seldom exceeding 2 feet in diameter, but reaching a height of 100 feet. It develops a long, clear bole, with a small, irregular-shaped crown.

Shortleaf pine is not tolerant. It will stand some shade in youth, but soon demands full sunlight. It ranks with loblolly in this respect.

Reproduction is generally good. Trees of this species left after lumbering are surrounded with seedlings. Since it is in nearly all respects a less desirable tree than loblolly, reproduction should not be encouraged.

In growth this species is slower than loblolly and faster than longleaf pine.

POND PINE.

Pond pine occurs on wet lands, swamps, savannahs, bays, and bottomlands, but reaches merchantable size only on the bottomlands. It is the tree most largely represented on waste lands, such as savannahs and bays.

In the bottoms it occurs in mixture with loblolly pine, maple, ash, red, white, and black oaks; in the deep swamps with cypress and black gum. In poor situations it sometimes occurs in almost pure stands.

Like the loblolly pine it will grow where there is standing water during the greater part of the year, but it develops best on the rich,

FIG. 1.—LOBLOLLY PINE AND HARDWOODS ON THE BORDER OF A SWAMP.

FIG. 2.—HARDWOODS ON SWAMP TYPE.

FIG. 1.—A MIXED STAND OF LOBLOLLY AND LONGLEAF PINE.

FIG. 2.—REPRODUCTION OF LONGLEAF PINE ON AN OLD BURN.

moist loams of the bottoms. On lands physically ill adapted to tree growth it is often the only tree present. It forms the bulk of the stand over considerable areas of low-lying wet lands, such as are found along the southeast boundary of Hell Hole.

When growing under favorable conditions it closely resembles loblolly pine, reaching about the same size and having similar form. On the waste lands it becomes a stunted tree, of small diameter and height. On the low flat lands it is a short-bodied, long-crowned tree, but attains diameters up to 20 inches.

Like the other pines, it is not a tolerant tree. In mixture its existence depends on its being dominant, and when in pure stands it forms a one-height class. Reproduction is not plentiful, but saplings are fairly numerous.

In good situations its growth resembles loblolly pine, but is slightly slower. On poorer soils it is slow; trees of 6 to 10 inches in diameter are from 50 to 60 years old.

CYPRESS.

Cypress occurs in the deep, wet swamps, pocosons, and bays, along streams, and on low flat lands where there is standing water at least part of the year. Occasionally specimens grow on the fresh uplands, but such are exceptional. It occurs for the most part as scattered individuals, or in small groups, occasionally nearly pure, over limited areas.

Black gum, loblolly pine, red gum, ash, maple, and occasional pond pine are nearly always present with the cypress. Yellow poplar is sometimes also in the mixture. Saplings and cypress often grow under loblolly pine as a lower story.

The best soil condition for cypress is a light sandy loam, with an abundance of standing water the year round. Hence the best cypress is in the deep swamps. A mucky soil, of which there is little on the tract, is said to cause shake, but otherwise it appears to be favorable to good development.

Cypress is the largest tree on the tract. Trees up to 50 inches in diameter are not uncommon. The largest tree found measured 75 inches in diameter. The cypress seldom exceeds 100 feet in height, but has a long, clear bole (50 to 60 feet long), and a short, irregular crown made up of rather large branches. On account of the "peck" (a form of rot to which it is subject) the top of the tree is generally killed back. In the pocosons the tree is much smaller.

Cypress is capable of standing considerable shade. The few seedlings which come up grow under very dense shade, and saplings seem to endure shade fairly well, though many are killed off by it.

Reproduction is very poor. Only occasional seedlings are seen, though saplings are numerous. These saplings are most plentiful in

the drier parts of the tract and along the edges of the swamps, which should indicate that seed does not germinate well in the wet places. The thickets of black gum, no doubt, also retard reproduction. The outlook for a crop to take the place of the one now mature and on the decline is poor.

The fungous disease commonly called "peck" is found in nearly every mature tree. It enters at some scar near the top and works down, making the affected parts worthless. Nearly all of the large trees have hollow butts.

While figures of growth could not be obtained for this species, the few trees the rings of which were counted showed very slow growth from early life to old age.

The clear length and height growth of this tree cease very early. (See Table XXI.) After 13 inches in diameter is reached they practically stop increasing. One great reason for this short period of height growth is doubtless the "peck," which causes the trees to become stagheaded.

TABLE XXI.—*Clear length and total height of cypress.*

Diameter breast-high.	Clear length.	Height.	Diameter breast-high.	Clear length.	Height.	Diameter breast-high.	Clear length.	Height.
Inches.	*Feet.*	*Feet.*	*Inches.*	*Feet.*	*Feet.*	*Inches.*	*Feet.*	*Feet.*
1	.....	16	11	56	79	21	58	88
2	.....	28	12	57	81	22	59	88
3	.....	38	13	57	83	23	59	89
4	.....	47	14	57	84	24	59	89
5	34	55	15	58	85	25	59	89
6	43	62	16	58	86	26	59	89
7	48	67	17	58	86	27	59	90
8	52	71	18	58	87	28	59	90
9	54	75	19	58	87	29	59	90
10	55	77	20	58	88	30	59	90

RED GUM.

Red gum occurs throughout the tract, from the dry to the very wet lands. By preference, however, it avoids the two extremes and seeks the moist flat lands on the edges of swamps and along streams. It associates with all species from longleaf pine to cypress, but is most often found with loblolly pine and trees of the bottomlands.

A fresh soil is necessary for the growth of red gums of any size, and a moist one is preferred. The tree reaches best development on moist loams where there is not standing water the year round.

It is not uniformly a large tree. Three feet is the maximum diameter, and 80 to 90 feet the maximum height. Under favorable conditions it develops a good, clear bole, and has a long, irregular crown. It is often defective from hollow butts.

A small amount of shade is endured throughout life, but large red gum trees seldom develop unless they enjoy full sunlight.

Reproduction from seed is rare, but from sprouts it is very common, especially on the moist pine lands.

BLACK GUM.

Black gum is one of the most largely represented species on the tract, growing in all situations except on the very sandy soils. The deep swamps are, however, the natural home of this species. It is always found in mixture, though it often makes up the bulk of the stands over considerable areas. It associates with all species except the longleaf pine, but most often with cypress, water oak, red gum, ash, maple, and loblolly pine.

Black gum is in no way fastidious as to its soil requirements, and will grow on any soil, provided moisture be present. It develops best on a moist or wet loamy soil.

Black gum is not a large tree on the tract. Trees up to 2 feet in diameter are common, but larger ones are not plentiful. The bulk of the trees are under 70 feet in height, but occasional ones reach 90 feet. Under the best conditions a clear bole of 35 to 40 feet and a rather long, straggling, flattened crown is developed.

This species is one of the most tolerant on the tract, often forming thickets under the shade of large trees; in fact, it is generally a tree of the lower story.

Reproduction by sprouts on moist pine lands is quite common, but seedlings are few. Saplings and poles are plentifully represented.

RED MAPLE.

Red maple occurs as scattered individuals throughout the bottom-lands, along streams, and in the deep swamps. Along streams and in the drier swamps, where the best maple occurs, it is associated with oaks, ash, hickory, and pond and loblolly pines; in the deep swamps, where it is perhaps more plentiful, with gums and cypresses.

Red maple requires a fresh soil, and prefers a moist or wet one. Its best development is on the moist, rich loams.

Maple is not a large tree on the tract, seldom exceeding 2 feet in diameter, though occasional trees over 30 inches in diameter are seen. Under favorable conditions it develops a long bole, with a rather large, irregular crown. It is very apt to be crooked and unsound.

It is one of the tolerant species. Saplings live under a dense shade for a long time. In this respect it ranks with the black gum. Reproduction is very scarce, but saplings and poles are plentiful throughout the swamps.

YELLOW POPLAR.

Yellow poplar occurs along streams and along the edges of and in swamps. It occurs infrequently, however, and only as single trees, is confined to limited areas, and makes up only a small part of the stand. It is found in mixture with all of the species growing in the bottoms, and also largely with cypress and the gums in the swamps.

Fresh or moist rich loams are practically the only soils on which this tree grows, as moisture, combined with proper soil conditions, is absolutely necessary to its life.

The yellow poplar grows to large size, exceeding 100 feet in height and 4 feet in diameter. It generally has a long, straight, cylindrical bole, with a small, flat, forked crown. It appears to be uniformly sound, but most of the trees are mature.

Yellow poplar is always a dominant tree on the tract, never growing under the shade of other trees. Next to longleaf pine it is the most intolerant species found. Reproduction is practically wanting. Saplings and poles are sparingly present, and the indications are that the species is not increasing its representation.

HICKORY.

Owing to similarity of occurrence and development, and to the relative nonimportance of this genus on the tract, all of the hickories found will be discussed collectively.

Scattered individuals occur along streams and pocosons and in the bottoms, associated with maple, ash, gums, oaks, beech, yellow poplar, cypress, and loblolly pine. Hickories are rarely found on the drier soils. A fresh or moist soil is sought, but excessively wet soils are avoided. A rich, light loam best favors its development.

Hickory seldom reaches a diameter of over 20 inches, though trees over 30 inches in diameter are occasionally found. It reaches a maximum height of about 80 feet. It is generally short, with a long, straggling crown, and is apt to be crooked and defective. Hickory is not so tolerant as the black gum or maple, but ranks more nearly with the red gum in this respect.

Reproduction other than from sprouts is almost never seen, and sprouts are not plentiful.

WHITE ASH.

White ash occurs as scattered individuals along streams and throughout the drier and in the deeper swamps. It is rarely of merchantable size, but is more frequently found in sapling and pole stages. It occurs in mixture with all the species found in both the bottoms and swamps.

A moist or wet soil is favorable to the growth of this species, a moist one preferred. Hence the best growth is on the rich loams of the bottomlands. The tree seldom exceeds 2 feet in diameter and 80 feet in height. Under favorable conditions it develops a long, clear bole and a small crown, but tends to be crooked and unsound.

Ash is one of the tolerant species, ranking with maple and the gums in this respect. Reproduction is very scant, but saplings and poles are plentiful in proportion to the number of large trees.

WATER OAK.

Water oak occurs throughout the deep swamps and bottoms and along runs and pocosons. It is the oak most largely represented on the tract. Scattered individuals are associated with all species except longleaf and shortleaf pine. It requires a fair amount of moisture and attains good growth even in standing water. The best development is found along streams and in the drier swamps on rich, moist loam.

The water oak reaches a large size. Trees 30 inches in diameter are not uncommon, and trees 4 feet in diameter are occasionally seen. It sometimes reaches a height of 90 to 100 feet. It has a rather long conical crown, with a fair length of clear bole. It is, however, often unsound. In tolerance it ranks with the red gum and hickories. Reproduction is nearly wanting, but saplings and poles are plentiful.

OTHER OAKS.

The white, black, red, and Spanish oaks all sometimes reach good size on the bottomlands. The post, blackjack, Spanish, and black oaks also occur on the drier soils, as stunted trees. They seldom, however, interfere with the reproduction of pine.

TREES ON THE COOPER RIVER HOLDINGS.

Common name.	Botanical name.
Loblolly pine	*Pinus taeda.*
Pond pine	*Pinus serotina.*
Shortleaf pine	*Pinus echinata* Mill.
Spruce pine	*Pinus glabra* Walt.
Longleaf pine	*Pinus palustris* Mill.
Bald cypress	*Taxodium distichum* (Linn.) Rich.
White cedar	*Chamaecyparis thyoides* (L.) B. S. P.
Red cedar	*Juniperus virginiana* Linn.
Bitternut hickory	*Hicoria minima* (Marsh.) Britton.
Shagbark hickory	*Hicoria ovata* (Mill.) Britton.
Mockernut hickory	*Hickoria alba* (Linn.) Britton.
Pignut hickory	*Hickoria glabra* (Mill.) Britton.
Swamp cottonwood	*Populus heterophylla* Linn.
Hornbeam	*Ostrya virginiana* (Mill.) Koch.
Blue beech	*Carpinus caroliniana* Walt.
Beech	*Fagus atropunicea* (Marsh.) Sudworth.
White oak	*Quercus alba* Linn.
Post oak	*Quercus minor* (Marsh.) Sargent.
Live oak	*Quercus virginiana* Mill.
Black oak	*Quercus velutina* Lam.
Spanish oak	*Quercus digitata* (Marsh.) Sudworth.
Blackjack oak	*Quercus marilandica* Muenchh.
Water oak	*Quercus nigra* Linn.
White elm	*Ulmus americana.*
Winged elm	*Ulmus alata.*

Common name.	Botanical name.
Hackberry	*Celtis mississippiensis.*
Red mulberry	*Morus rubra.*
Yellow poplar	*Liriodendron tulipifera.*
Red gum	*Liquidambar styraciflua.*
Red maple	*Acer rubrum.*
Dogwood	*Cornus florida.*
Black gum	*Nyssa sylvatica.*
Persimmon	*Diospyros virginiana.*
White ash	*Fraxinus americana.*

TREES AND SHRUBS FORMING UNDERBRUSH.

Titi	*Cliftonia monophylla.*
Gallberry (inkberry)	*Ilex glabra* (Linn.).
Green brier	*Smilax laurifolia.*
Devilwood	*Osmanthus americanus.*
Sweet magnolia (white bay)	*Magnolia glauca.*
Loblolly bay	*Gordonia lasianthus.*
Red bay	*Persea borbonia.*
Rattan	*Bignonia caprealata.*
Hurrah brush	*Andromeda floribunda.*
Wax myrtle	*Myrica cerifera.*
American holly	*Ilex opaca.*
Yaupon	*Ilex vomitoria.*
Purple buckeye	*Æsculus octandra.*
Prickly ash	*Xanthoxylum clava-herculis.*

PART II.—MANAGEMENT.

INTRODUCTION.

Conditions are exceedingly favorable on the Cooper River holdings for the application of practical forestry. There is a good present stand of mature timber, and a ready market for it; an excellent young growth develops after lumbering, provided the cut-over lands are protected against fire—a matter which is entirely practicable at a small expense; the cost of logging and transportation to the mill is very low; and the mill itself is thoroughly equipped and remarkably well situated to facilitate a large and varied output.

The capital invested in mill, transportation system, and timberlands is considerable; therefore a system of management which would insure the company a continuous yield of timber is highly desirable, provided such management would not seriously interfere with present profits. If it can be so arranged that, as soon as the company's holdings are entirely cut over for the first time, the lands first lumbered will once more support a merchantable stand ready to be cut, such an arrangement is obviously a good business policy. If this can be done, the capital remains invested; if not, after the lands are cut over, returns cease, and, except for that part of the investment which can be disposed of, the capital account is wiped out.

In the following pages it is shown that by the addition of certain amounts of land it is both practicable and profitable to carry on operations on the basis of a sustained yield equal to the highest present capacity of the mill.

PRESENT AND FUTURE YIELDS OF PINE.

Table XXII shows the present average yield in board feet per acre of loblolly and longleaf pine combined, and the yield that may be expected after ten, twenty, thirty, forty, and fifty years, cutting to different diameter limits. The number of years that must elapse before a cut equal to the present may be again obtained is also shown. This table is constructed from an average of all acres of timber measured on the tract.

Future yields are obtained by ascertaining how many trees of each diameter are left on the ground if a given diameter is cut to (see Tables I, II, and III), and then finding by the use of Tables XI and

XVI (age on basis of diameter) how large these trees will be at the end of ten, twenty, thirty, forty, and more years. The contents of these trees is then calculated from the volume tables, the result giving the yield in board feet at the end of each decade.

As shown in Table XXII, the second cut of timber after ten, twenty, or thirty years is greater with a diameter limit of 14 inches than if a diameter limit of 16 inches be adopted. Raising the diameter limit usually results in increasing the second cut of timber which may be expected after a given period. That this does not happen on the Cooper River timberlands is explained by the fact that in cutting to 14 inches the trees left standing which will become merchantable if the second cut to the same diameter limit is made after ten, twenty, or thirty years will yield more board feet of lumber at the end of the period than will those left if the diameter limit is set at 16 inches for both cuttings.

This is because the number of trees of small diameter which will become 14 inches but will not become 16 inches in diameter within the given period more than offsets the timber produced by trees 14 and 15 inches in diameter.

TABLE XXII.—*Present and future yields of pine per acre, and time required before a yield equal to the present may again be obtained.*

Cutting limit, diameter breast-high.	Present yield per acre.	Yield after 10 years.	Yield after 20 years.	Yield after 30 years.	Yield after 40 years.	Yield after 50 years.	Time before a yield equal to present may be obtained.
Inches.	*Bd. feet.*	*Bd. feet.*	*Bd. feet.*	*Bd. feet.*	*Bd. feet.*	*Bd. feet.*	*Years.*
10	6,033	1,086	3,318	5,758	8,143	10,648	31
12	5,385	1,098	3,416	6,566	9,362	12,640	25
14	4,729	1,263	3,753	8,293	11,086	14,543	22
16	4,021	1,124	3,165	7,697	11,968	15,670	22

SUSTAINED ANNUAL YIELD.

In estimating the amount of land necessary for a sustained annual yield, it is assumed that land, if acquired, will be of the same character as that now owned by the company.

Since the chances for a second crop of cypress are small (on account of its scant reproduction and slow growth), and since most of the hardwoods are at present unmerchantable, these are not considered in this calculation. The company at present does not intend to cut over 20,000,000 board feet per year from their own land, but the mill, if running at full capacity, might easily handle 40,000,000 feet.

In Tables XXIII, XXIV, and XXV is shown the amount of land necessary for a sustained annual yield of 20, 30, and 40 million board feet of pine, cutting to different diameter limits; and the amount necessary, cutting to 14 inches, with a 30-year rotation. The amount

of land required varies with the yield per acre; the greater the yield the smaller the area, necessarily.

Tables XXIII, XXIV, and XXV show how many acres must be added to the present holdings of the company to secure an output from the mills of 20, 30, or 40 million board feet per year during the period of the second cut, provided the added acreage is of the same character as that now owned.

TABLE XXIII.—*Sustained annual yield of 20,000,000 board feet of pine.*

Cutting limit, diameter breast-high.	Annual yield per acre.	Area to be logged annually.	Time required to cut over present tract.	Time required before second yield equal to first can be obtained.	Total area necessary for sustained annual yield.	Additional area to be acquired for sustained annual yield.
Inches.	*Board feet.*	*Acres.*	*Years.*	*Years.*	*Acres.*	*Acres.*
10	6,033	3,315	12	31	102,765	63,065
12	5,385	3,714	10.7	25	92,850	53,150
14	4,729	4,229	9.4	22	93,038	53,338
16	4,021	4,974	8	22	109,428	69,728

TABLE XXIV.—*Sustained annual yield of 30,000,000 board feet of pine.*

Cutting limit, diameter breast-high.	Annual yield per acre.	Area to be logged annually.	Time required to cut over present tract.	Time required before second yield equal to first can be obtained.	Total area necessary for sustained annual yield.	Additional area to be acquired for sustained annual yield.
Inches.	*Bd. ft.*	*Acres.*	*Years.*	*Years.*	*Acres.*	*Acres.*
10	6,033	4,973	8.0	31	154,163	114,463
12	5,385	5,571	7.1	25	139,275	99,575
14	4,729	6,344	6.3	22	139,568	99,868
16	4,021	7,461	5.3	22	164,142	124,442

TABLE XXV.—*Sustained annual yield of 40,000,000 board feet of pine.*

Cutting limit, diameter breast-high.	Annual yield per acre.	Area to be logged annually.	Time required to cut over present tract.	Time required before second yield equal to first can be obtained.	Total area necessary for sustained annual yield.	Additional area to be acquired for sustained annual yield.
Inches.	*Bd. ft.*	*Acres.*	*Years.*	*Years.*	*Acres.*	*Acres.*
10	6,033	6,630	6.0	31	205,530	165,830
12	5,385	7,428	5.3	25	185,700	146,000
14	4,729	8,458	4.7	22	186,076	146,376
16	4,021	9,948	4.0	22	218,856	179,156

TABLE XXVI.—*Comparison of rotations for sustained annual yield of 20,000,000 board feet of pine.*

Cutting limit, diameter breast-high.	Rotation.	Present yield per acre.	Yield per acre second time tract is logged.	Area to be logged over annually.		Time required to cut over present tract.		Area necessary for sustained annual yield second time land is logged.
				First time land is logged.	Second time land is logged.	First time.	Second time.	
Inches.	*Years.*	*Bd. ft.*	*Bd. ft.*	*Acres.*	*Acres.*	*Years.*	*Years.*	*Acres.*
10	31	6,033	6,033	3,315	3,315	12.0	12.0	102,765
10	30	6,033	5,758	3,315	3,473	12.0	11.4	104,190
10	40	6,033	8,143	3,315	2,456	12.0	16.2	98,240
12	25	5,385	5,385	3,714	3,714	10.7	10.7	92,850
12	30	5,385	6,566	3,714	3,046	10.7	13.0	91,380
12	40	5,385	9,362	3,714	2,136	10.7	18.6	85,440
14	22	4,729	4,729	4,229	4,229	9.4	9.4	93,038
14	30	4,729	8,293	4,229	2,412	9.4	16.5	72,360
14	40	4,729	11,086	4,229	1,804	9.4	22.0	72,160
16	22	4,021	4,021	4,974	4,974	8.0	8.0	109,428
16	30	4,021	7,697	4,974	2,598	8.0	15.3	77,940
16	40	4,021	11,968	4,974	1,671	8.0	23.8	66,840

THE ROTATION FOR PINES.

By rotation is understood the number of years that must elapse between the harvesting of successive crops on a given area.

In Tables XXIII, XXIV, and XXV it is shown that if the land is reworked at the time when a cut equal to the present can again be obtained, cutting to 14 inches will permit an earlier second cut, and necessitate the buying of only a few more acres of land to furnish a sustained annual yield than if a 12-inch diameter limit is adopted, and much less than is required if a 10 or 16 inch limit is used. Though either a 12 or 14 inch diameter limit, with a rotation of twenty-five years in the first case and of twenty-two years in the second case, would be satisfactory, there are reasons why a longer rotation should be adopted.

When a tract is put under forest management it is assumed that it is to be kept in timber for all time and that a certain amount of timber is to be taken from it each year to supply a steady demand. Forest management aims, by fire protection and careful lumbering, to bring about normal conditions in the forest and make each acre produce to its utmost capacity. The stand of timber on the lands of the E. P. Burton Lumber Company is not at present normal; as a consequence of repeated forest fires the yield is too small. If enough land is bought to give a sustained annual yield of 20,000,000 board feet and the area is cut over when a crop equal to the present can again be obtained, the stand per acre will be smaller than if a longer rotation were adopted, the area lumbered annually will be larger (which means greater expense for railroad and hauling), and more land will have to be purchased to supply the yearly demand.

The object should be to get a sustained annual yield from as small an area as possible, provided this does not materially interfere with

or increase the cost of present operations. The smaller the area the smaller the invested capital and the yearly tax list, and in the long run this means the saving of a considerable sum of money.

In Table XXVI is shown the amount of land necessary for a sustained annual yield under different rotations and diameter limits. It is seen that the smallest amount of land is needed when a 16-inch diameter limit and a 40-year rotation are adopted. As previously stated, if any rotation is adopted longer than the one when a cut equal to the present can again be obtained, the tract, when cut over for the first time, will not furnish enough pine to supply the mill. If 14 inches is cut to, it is thought that the cypress and hardwoods, combined with the added volume of stands of pine not coming under the ax for some time, will furnish enough extra material to give the mill (combined with the present stand of pine) a 30 years' cut, but possibly not enough to give a 40 years' cut if 16 inches is cut to. Since it is not advisable to buy the large amount of logs that would be needed to give the mill a 40 years' cut, the 16-inch diameter limit and 40-year rotation are impracticable. Cutting to 14 inches with a 30-year rotation, while requiring more land for a sustained annual yield, will give a larger present cut per acre and will not necessitate buying logs to supply the mill before a full yield can again be obtained from the lands first logged. To secure the same output during the next thirty years, or the period which must elapse before the second cutting begins, the difference between 4,729 board feet and 8,293 board feet per acre for the number of acres to be cut annually must be secured in addition. The growth which will accrue to stands of pine which are not to be cut for some years will partly supply this deficiency, and the cypress and such hardwoods as can be disposed of will suffice to make up the rest. This rotation and diameter limit are therefore recommended for all pine lands controlled by the E. P. Burton Lumber Company.

TABLE XXVII.—*Sustained annual yields of pine, with a 14-inch diameter breasthigh cutting limit and a rotation of 30 years.*

Sustained annual yield of tract.	Annual yield per acre.	Area to be logged annually.	Time required to cut over present tract.	Time required before second yield equal to first can be obtained.	Total area necessary for sustained annual yield.	Additional area to be acquired for sustained annual yield.
Board feet.	*Bd. ft.*	*Acres.*	*Years.*	*Years.*	*Acres.*	*Acres.*
20,000,000	8,293	2,412	16.5	30	72,360	32,660
30,000,000	8,293	3,618	11.0	30	108,540	68,840
40,000,000	8,293	4,823	8.2	30	144,690	104,990

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OBJECTS SOUGHT ON DIFFERENT TYPES OF FOREST LAND.

LOBLOLLY PINE LAND.

There is no doubt but that on land suited to its growth loblolly pine is the most profitable species that can be grown in this region. Such land is capable of supporting heavy stands, and should be kept as nearly pure as possible. Ordinarily this will not be a hard thing to manage. In marking trees for removal it will sometimes be necessary to leave trees above the diameter limit. These should always be of loblolly pine on land well suited to its growth, and since loblolly is a much more prolific seeder than the other pines growing here, few of the other species will be established. It must be remembered that loblolly should not be forced on land where it does not plainly grow to better advantage than longleaf.

All possible hardwoods should be removed, since they take up room that might be devoted to the growth of loblolly pine, besides keeping back reproduction to some extent. Yields will be greatly increased in this type as soon as fires become less frequent and young growth is properly protected.

LONGLEAF PINE LAND.

Fire, lumbering, and boxing for turpentine have left the longleaf pine lands in very poor condition. The object in this type of forest should be to increase the density of the stand by filling up the large blanks with young growth. This can be done by keeping out fire, cutting to 14 inches diameter breasthigh, and, when necessary, leaving trees above the diameter limit for seed. If measures are taken to bring in young growth, these lands, after two or three rotations, will yield from two to three times as much timber as at present.

SWAMP LAND.

Swamp land bears a stand of timber which is very mixed in character. Nearly all of the species found on the tract, except longleaf pine, may occur in the swamps. The commercially important species—cypress, loblolly pine, and yellow poplar—are intermixed with a growth of gums, oaks, ash, and maple, which keep back reproduction of the important species to a great extent. Yellow poplar is of rare occurrence, and will never be an important species in this section. Cypress grows very slowly and reproduces poorly, so that after the present stand is removed there is small hope of another crop. The future value of the swamp type depends on increasing the proportion of loblolly. This can be done by removing hardwoods whenever possible and leaving loblolly seed trees.

It is of particular importance in marking trees for removal that unless a good stand remains below the diameter limit, one and often two trees above the diameter limit be left on each acre for seed.

LUMBERING.

REMOVAL OF HARDWOODS.

Besides the hardwoods in the swamps, there is, wherever moisture is present in sufficient quantities, a growth of hardwoods on the pine lands. These hardwoods form an understory, and in the present forest do little harm. Hitherto fires have kept them back by killing off the smaller trees. As soon as fire is kept out of the pine forests, however, hardwoods will become more plentiful, and possibly will hinder the reproduction of pine. Therefore hardwoods should be removed so far as possible when the pine lands are being logged. Unfortunately the uses that hardwoods of the class found on pine lands can be put to are limited.

WHAT HARDWOODS CAN BE USED FOR.

In a flat country, such as the one under consideration, railroading is sometimes made difficult by the soft places which allow the track to sink. To support it poles are often laid under the ties, and too commonly pine is used for this purpose. By using hardwoods instead the latter would be got rid of and the supply of young pine saved. Hardwoods should also be used for all temporary bridging and crib work, and, when possible, for skids.

A large number of ties are used yearly by the company on their log trams. At present a few of these are cypress, but most are of pine. Since ties are hewed, the pines used for this purpose are pole pines of the right size to make a tie. This use of pine trees for ties should be avoided, for it reduces the yield at the next cut. A good many ties could be obtained from pine tops, a few from hardwoods, and what more were required from pocoson cypress. Cypress makes excellent ties, and though a valuable timber, the chances for a second crop are very poor, so that small trees of this species can well be used for this purpose.

For fuel the locomotives now use either fatty knots or trees cut down and sawed up for this purpose. A considerable amount of good pine is thus used. If possible this waste should be avoided. Cull trees, pine tops, hardwoods, and down timber should be used for firewood so far as possible.

THE STEAM SKIDDER.

In lumbering nearly all of the logs are dragged from the stump to the track by steam skidders. By their use the cost of logging is greatly reduced, but great damage is done the trees left standing. Many are broken off or uprooted and many more are barked or bruised by the logs. All possible precautions should be taken in skidding logs to see that as little damage as possible is done the standing trees.

Steam skidders aid greatly in reproduction, since they tear up the soil and thus make an excellent seed bed for the pines. They also materially lessen the danger from fire by mixing the very inflammable material on the ground with soil, so that it does not burn readily.

HEIGHTS OF STUMPS.

At present loblolly pine stumps are cut about 2 feet high, and longleaf pine often higher. In the case of longleaf pine it is often advisable to cut high stumps to avoid an old box or an injury which has caused a pitchy butt. In the case of loblolly pine, the only thing that should cause a high stump to be cut is a bad fire scar or other unsoundness. Table XXVIII shows the amount of timber saved by cutting stumps 1 and 1½ feet high instead of 2 feet, as is done at present. It is seen that for trees of the larger diameters the saving is considerable. It is recommended that all pine stumps be cut not higher than 1½ feet unless the butt of the tree is unsound. With the present distribution of age classes, this would mean a saving of about 5½ million board feet over the whole tract.

TABLE XXVIII.—*Amount of timber saved by cutting stumps 1 and 1½ feet from ground instead of at the present height of 2 feet.*

Diameter breast-high.	Gain per tree by cutting—		Number of trees necessary to save 100 board feet cutting—	
	1-foot stumps.	1½-foot stumps.	1-foot stumps.	1½-foot stumps.
Inches.	*Board feet.*	*Board feet.*		
10	3	2	33	50
13	7	2	14	50
16	10	5	10	20
18	12	6	8	17
20	16	9	6	11

SUPERVISION AND PROTECTION.

MARKING TREES FOR REMOVAL.

It is necessary to mark all pine trees that are to be cut if the best results are to be obtained. Ordinarily this will simply mean the marking of all pine trees 14 inches and over in diameter breasthigh, but in case this leaves too few trees for seed purposes, trees of larger size must be left. When this necessity occurs, one or two trees capable of withstanding wind, and in other ways well suited for seed trees, must be selected and left on each acre. When trees over the diameter limit are left, enough trees below this limit should be removed to compensate for the larger ones. In removing trees below the diameter limit great care should be exercised. These trees should not be removed where the stand is open, but from areas where the number of small trees is great.

Leaving trees above the diameter limit will have to be most largely practiced on swamp lands, where pine trees often occur singly or in small groups. It is most important here that the representation of loblolly pine be increased.

It is estimated that, for the present, one man should be able to do all of the marking at a yearly cost of $375.

NECESSITY FOR A FORESTER.

It is strongly recommended that the services of a forester be secured by the E. P. Burton Lumber Company. If the tract is to bear timber to its full capacity, the forest must be brought into normal shape as soon as possible. In order to bring this about a competent man must watch the marking and logging very closely.

The services of a forester should be secured at a yearly cost of $1,500 and living expenses. His duties should include:

(1) A systematic marking of trees for removal, with inspection to see that no areas are cut over on which trees have not been marked.

(2) A careful study of the logging, with a view to eliminating waste from high stumps, odd log lengths, leaving logs in the tops, leaving logs in the woods, breaking trees in felling, and damaging small trees in felling other trees. Waste in these various ways is considerable during the year, and the direct saving which a forester could effect along these lines would defray no small part of his salary.

(3) The organization of a systematic patrol of the lands to keep out fire, with personal direction of the work of putting out bad fires.

(4) The laying out of the trams so that old and defective stands of timber may be removed first, and young and thrifty stands allowed to put on growth as long as possible. This is very important, since, if properly carried out, the stands not coming under the ax for ten, twenty, or more years will increase in value by several million board feet.

(5) The examination of all lands under consideration for purchase to report upon their suitability for forest management.

If waste is appreciably reduced, fires kept out, and the forest cut so that young stands are left until the last, the result will be a saving to the company which will far more than pay the salary of a competent man.

PROTECTION AGAINST FIRE.

Fire is the worst enemy of the forest on the lands of the E. P. Burton Lumber Company. Fire keeps back reproduction of pine and thins out the existing stands. This thinning out of the stands is accomplished—

(1) By killing trees outright.

(2) By burning out butts until the trees are so weakened that they are windthrown.

(3) By encouraging the growth of fungi, which weaken the trees, cause windfall, and render the diseased parts worthless for lumber.

Fire protection on this tract is difficult because of the ease with which fires can be started, not because of the intensity of the fires. Grass fires are generally easily put out, either by whipping them out with brush or by back firing. Slash fires are more serious, but less common. Lumbering so tears up the ground and lessens the inflammability of the ground litter that with slight precautions fire can be prevented on cut-over lands.

Fire protection for the present should be directed mainly to the cut-over lands where a young growth of pine is starting or may start, but all lands should also be protected and fires put out so far as possible. One man can at present easily patrol the holdings, and fires should not get beyond control before they will be discovered. The ranger should put out small fires himself; but in case of a fire becoming dangerous help should be furnished him upon demand.

It is estimated that one man employed for eight months of the year, at a cost of $200, should pretty thoroughly keep fire from doing great damage on the tract.

COST OF CONSERVATIVE MANAGEMENT.

Cutting to 14 inches diameter breasthigh will curtail the present cut of pine by about 656 board feet per acre, or 26,043,200 board feet for the present holdings. This curtailment is in the trees from 12 to 14 inches in diameter, which will form part of the yield thirty years hence, when the second cutting is made.

The actual expenses per year, aside from the value of the timber left standing which might be cut, are estimated as follows:

Fire protection	$200
Marking trees for removal	375
Salary of a forester	1,500
Living expenses of a forester	300
Total	2,375

These expenses must be justified by the increase in the productiveness of the forest.

RULES FOR LUMBERING.

The following rules should be enforced in lumbering the tract of the E. P. Burton Lumber Company:

(1) All pine to be cut shall be marked, and no trees shall be cut that are not marked.

(2) All pine 14 inches and over in diameter breasthigh shall be marked for removal, unless in the judgment of the forester the tree should be left for seed. If trees above the diameter limit are left for seed, enough trees below the limit should be cut to offset the large

trees. These smaller trees should be removed only when no damage to the forest will result.

(3) Stumps shall not be cut higher than 18 inches, if the butts are sound.

(4) Ties shall be cut from pine tops, pocoson cypress, and hardwoods, not from pole pine.

(5) Hardwoods shall be used for track corduroy instead of young pine, so far as possible. If the use of young pine is unavoidable, they shall be cut, not among scattered trees, but from dense thickets, in the form of thinnings.

(6) Culls, tops of felled trees, and hardwoods shall be used for firewood; no young pine shall be cut for this purpose.

(7) In felling great care shall be exercised not to injure trees left standing for a second crop.

(8) In skidding logs all possible care shall be exercised not to injure standing trees.

(9) Tops which fall close to standing trees shall be lopped close to the ground to a distance from the trees which, in the judgment of the forester, will avoid danger from slash fires. At first this distance should be 15 feet. It may subsequently be reduced or lengthened as experience dictates.

(10) Hardwoods should be removed wherever possible.

CONCLUSIONS.

This working plan shows plainly that conservative treatment of the timberlands of the E. P. Burton Lumber Company is practical—

(1) Because conservative treatment will greatly increase the yield of timber on the tract; and

(2) Because it will make a permanent investment out of what is at present a temporary one.

By increasing the holdings a sustained annual yield may be obtained so that the mill will be supplied with timber for all time and the forest be as valuable at any time as it is at present.

In order to secure the above results, fire must be kept out, young trees protected where lumbering is going on, and no trees cut which have not reached a diameter of 14 inches. Loblolly pine, being a tree of very rapid growth and being well suited to the locality, should be favored as much as possible, that its range may be extended. This tree should, so far as possible, replace the cypress and hardwoods, since cypress is too slow growing to be profitable, and the hardwoods are not now and will not be for a long time of much commercial value.

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MAP OF COOPER RIVER HOLDINGS, OF THE E. P. BURTON CO. BERKLEY CO., S.C. 1903.

LEGEND.

AVERAGE STAND OF PINE PER ACRE:

- 1 — 0 TO 2500 ..... BOARD FT.
- 2 — 2500 TO 5000 .. ..
- 3 — 5000 TO 7500 .. ..
- 4 — 7500 TO 10000 .. ..
- 5 — 10000 TO 15000 .. ..

AVERAGE STAND OF CYPRESS PER ACRE:

- 0 TO 2000 ..... BOARD FT.
- 2000 TO 4000 .. ..
- 4000 TO 6000 .. ..
- SWAMP.
- BAY.
- POCOSIN.
- FIELD.
- BOUNDARY OF BLOCK.
- ADVERSE HOLDINGS.

TRUE NORTH 0°

AVERAGE DIAMETER OF TREES 10 IN. AND OVER, WITH PERCENTAGE OF SPECIES IN STAND.

DIAMETERS:	LOBLOLLY.	LONGLEAF.	CYPRESS.
10"–14"	○	△	□
15"–18"	◔	▲	▣
19"–20"	◔		▣
19"–22"			▣

KEY.

60 = LOBLOLLY 60% – AVERAGE DIAMETER 15"–18".

SCALE.

CHAINS. 80 0 1 2 3 MILES.

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